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DAIRY-HERD TESTING IN NEW ZEALAND.

REVIEW OF THE 1923–24 SEASON.

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FINAL figures in connection with dairy-herd testing during the season of 1923–24 show that 151,214 cows were systematically tested, these falling into 188 groups or associations. This represents an increase over the previous season of fifty-one associations and 66,389 cows, or 37·2 per cent. and 78·2 per cent. respectively.

Officers of the Dairy Division controlled the testing of 37,378 cows, which were included in sixty-one associations. Several changes in administration took place: that is to say, certain associations which in the previous year were under private auspices were last season conducted by the Division, while we were relieved of certain others. Of the 137 associations in existence in 1922–23 twenty-six did not continue last season. These, however, were small organizations, the total number of cows being only 12,090.

It will be obvious that the system is working its way from district to district, so that there are now very few parts of the country which have not had experience with this work. An analysis of the situation for several years shows that some associations continue for two or three seasons and then drop out, but to revive when the original herds have been replaced by the younger stock coming on. This discounts any idea that quite a number of associations operate

for a short period and then permanently discontinue. This phase of the question, however, cannot be handled in detail in the present review.

A special endeavour has been made to obtain yield returns from as many associations as possible, and we have been successful in procuring figures for 107,201 cows. Owing to the large number of associations now represented in the summaries—namely, 138—it has been found necessary to abandon the publication of individual association averages, and to confine our tables and comments to the main groups into which the subject falls.

The following table gives the position so far as available returns are concerned, associations controlled by Dairy Division officers and those under private control having been combined. Figures for any cow which milked less than 100 days have been excluded :—

Table 1.

	1923–24.	1922–23.
Number of associations	138	81
Number of herds	3,820	2,085
Number of cows	107,201	50,683
Average number of herds per association	28	26
Average number of cows per herd	28	24
Average number of cows per association	777	626

The next tabulation forms a grand summary of results for all cows in New Zealand which were systematically tested during the last two seasons, on a lactation period exceeding 100 days, and for which we have figures :—

Table 2.

—	1923–24.		1922–23.	
	Days.	Pounds Butterfat.	Days.	Pounds Butterfat.
Average of all cows (107,201 in 1923–24 and 50,683 in 1922–23)	230	212·75	226	233·82
Highest association average	255	302·86	273	311·47
Lowest association average	175	140·16	170	159·49
Highest individual herd	301	585·76	324	518·93
Lowest individual herd	120	57·25	141	64·06
Highest individual cow	300	780·12	..	739·41
Lowest individual cow	109	18·23	105	26·22
Average daily production of butterfat per cow	..	0·9247	..	1·0366

Comparing the two seasons, the most apparent fact is that the average yield in 1923–24 decreased by 21·07 lb. butterfat. This position must not be interpreted as signifying that our dairy cows are going back in quality. The rapid increase in herd-testing has naturally brought in a large number of new herds, and some of the associations which commenced last season are located in outlying and newly settled districts. This obviously must tend to reduce the average, as indicated by the results for the preceding year from a smaller proprotion of newly established associations. Again, climatic conditions during the season 1923–24 were not as satisfactory as those for the previous season. There was a very dry period in late spring and

early summer, while in autumn serious floods occurred in several dairying districts. The important thing, however, is to get as many cows as possible tested, and then improved average production must follow as a natural sequence.

Taking out from the averages those associations which operated in 1923–24 for the first time, there remain seventy-four associations which have been running for at least two seasons. A comparison of results from these is probably a fairer way of comparing the average production of cows on test for the two last seasons. The position is as follows :—

Table 3.

Season.	Number of Associations.	Number of Cows.	Average Days.	Average Pounds Butterfat.
1922–23	74	47,172	225	232·65
1923–24	74	50,350	227	217·87
Differences in 1923–24	..	+3,178	+2	−14·78

On this basis, therefore, the difference is only 14·78 lb. butterfat.

In the following table are compared the yields for the same herds (Dairy Division associations only) on test during the two past seasons :—

Table 4.

Season.	Herds.	Cows.	Days.	Pounds of Butterfat.
1923–24	357	8,879	239	242·31
1922–23	357	9,017	247	246·46

This is perhaps the most useful comparison of all, and more accurately shows what improvement, if any, has been effected. In this case it will be noticed that the difference in average production for the two years is only 4·15 lb. butterfat. The difference in the average length of milking-period is, however, eight days, so that on a per-day basis these herds have improved in production.

SIGNIFICANCE OF LENGTH OF LACTATION PERIOD.

Referring again to the grand summary (Table 2), next to the fact of decrease in average production comes the question of the length of milking-period. It will be noted that for the 1922–23 season this was 226 days, and for 1923–24 230 days, an advance of four days. Under the various circumstances which are to be taken into consideration, this must be accepted as satisfactory. The writer has frequently expressed the opinion that the season of the average dairy cow in New Zealand is too short. This 230 days represent less than eight of the thirty-day periods into which the herd-testing association season is subdivided, which means that there are more than four months in which our average dairy cow is doing nothing in butterfat-production. During that period she requires bodily maintenance, and general charges bearing on the cost of the cow's keep continue much as during the milking-period. Two months' rest from milk-production should be sufficient.

If every one of the 151,214 cows on test in the Dominion last year had produced for ten months instead of for less than eight—that is to say, for 300 days instead of 230—what would it have meant in returns to the industry? Taking the records available for 107,201 cows tested last season, and assuming that the cows milked the extra two months and during that period produced in proportion to their average for the season, it is estimated that about 50 lb. of butterfat each would have been added, or a total of 5,360,050 lb. more butterfat. With butterfat at 1s. 6d. per pound, this is equal to £402,004, or, to each herd-owner, £105 5s. for the two months. But this is only for cows included in our averages. The longer lactation, if it applied to all the 1,184,977 cows in normal milk last season, would mean an astonishing additional sum.

Progressive dairy-farmers recognize that a prolonged milking-period is the outcome of breeding and feeding for the longer lactation period. First of all there must be a herd sire, which can best be chosen with regard to the results of the certificate-of-record testing of purebred dairy cows. The C.O.R. testing provides for a 365-day production. If it is proved that for several generations certain females can maintain their production for a whole year, then it is a reasonable assumption that by mating a bull from such dams with ordinary herd cows the average term of profitable lactation will in time increase. Dairy-farmers should fully realize that money spent in the purchase of a butterfat-record purebred sire is well invested.

SUMMARY OF 210-DAY RETURNS.

The Dairy Division officers have supplied returns on the basis of all cows in milk for not less than seven periods—that is, 210 days. A summary on this basis is interesting in that it more nearly shows what the average cow is capable of producing. It is, of course, necessary to know what each cow on test actually yields, and the 100-day summary supplies this want. It must be recognized, however, that many cows are for various reasons withdrawn or culled in the early stages of their lactation period. A cow may be sold or injured, or for some other reason be discontinued. Of the 30,773 cows tested by Dairy Division officers and eligible for inclusion in a return deleting all animals in milk less than 100 days, 20,208 qualified for inclusion in a 210-day summary. The tabulated results for this classification are as follows:—

Table 5.

	Days.	Pounds Butterfat.
Average of all cows (20,208)	265	257·16
Highest association average	297	338·93
Lowest association average	238	188·41
Highest individual herd	245	484·17
Lowest individual herd	240	109·15
Highest individual cow	311	633·26
Lowest individual cow	257	61·51
Average daily production of butterfat per cow		0·9709

Compared with the previous season, this shows a decrease in average yield of 9·94 lb. of butterfat, and an increase in average lactation of 7 days per cow.

C.O.R. AND ASSOCIATION RESULTS COMPARED.

An interesting study lies in the comparison of results where the same cows were tested under both certificate-of-record and association system during the same season. Our earlier experience has again been borne out during the season under review — namely, that if samples and weights are carefully taken the association method will, on the whole, show results as accurate as are necessary. The C.O.R. system may be accepted as giving the highest degree of accuracy practicable, and therefore may be taken as the standard by which the results from other systems may be judged. Then again, the testing breeders of pure-bred dairy cows may be taken as the better-class dairymen, so that the cows would be well cared for, and the sampling and weighing of milk for the association would be carefully and conscientiously carried out.

Following is a tabulated statement of returns for last season, comparing results where the same cows were on both association and C.O.R. test :—

Table 6.

Cow.	Certificate of Record.		Association.		Difference in Butterfat.
	Days.	Butterfat.	Days.	Butterfat.	
		lb.		lb.	lb.
1	291	359·63	291	346·35	13·28
2	294	417·11	294	400·40	16·71
3	347	644·02	347	652·46	8·44
4	223	498·48	223	487·73	10·75
5	287	516·08	287	503·51	12·57
6	293	402·68	293	405·19	2·51
7	281	422·44	281	424·90	2·46
8	337	497·71	337	491·16	6·55
9	266	540·37	266	497·19	43·18
10	206	336·55	206	329·51	7·04
11	163	201·22	163	200·67	0·55
12	302	402·61	302	404·92	2·31
13	281	425·77	281	415·28	10·49
14	283	366·56	283	365·15	1·41
15	312	477·83	312	482·79	4·96
16	275	377·16	275	370·04	7·12
17	262	399·58	262	381·69	17·89
18	260	345·68	260	360·79	15·11
19	255	383·95	255	394·94	10·99

Summary.

Total cows	19	Average days (C.O.R. and association)	274
Total days (C.O.R. and association)	5,218	Average butterfat (C.O.R.) ..	421·86 lb.
Total butterfat (C.O.R.)..	8,015·43 lb.	Average butterfat (association)	416·56 lb.
Total butterfat (association)	7,914·67 lb.	Average butterfat difference (Including plus and minus variations.)	10·22 lb.
Total butterfat difference	194·32 lb.		

Average difference to average C.O.R. butterfat = 2·4 per cent.

It will be admitted that an average difference of 10·22 lb. butterfat on an average C.O.R. yield of 421·86 lb., or 2·4 per cent., affords proof of the practical reliability of the herd-testing association system.

THE MOVEMENT BY DISTRICTS.

The following table, based on the official agricultural and pastoral statistics taken as at 31st January, 1924, indicates how the herd-testing movement is represented in the various land districts, also in the North and South Islands :—

Table 7.

Land District.	Total Number of Cows in Milk and Dry, 31/1/24.	Total Number of Cows in Milk, 31/1/24.	Total Number of Cows tested, 1923-24.	Percentage of Cows in Milk and Dry tested.	Percentage of Cows in Milk tested.	Number of Associations or Groups.	Average Days in Milk.	Average Yield of Butterfat.
								lb.
North Auckland	197,324	174,965	15,102	7·65	8·63	15	206	186·24
Auckland ..	314,077	288,903	72,404	23·05	25·06	63	234	208·78
Gisborne ..	30,961	26,328	3,082	9·95	11·71	6	209	202·16
Hawke's Bay ..	54,233	46,880	4,391	8·10	9·37	8	231	228·34
Taranaki ..	203,500	192,220	18,567	9·12	9·66	39	233	246·66
Wellington ..	204,645	184,450	30,584	14·94	16·58	37	237	215·60
North Island ..	1,004,800	913,746	144,130	14·34	15·77	168	231	213·29
South Island ..	307,789	271,231	7,084	2·30	2·61	20	194	197·47
Dominion ..	1,312,589	1,184,977	151,214	11·52	12·76	188	230	212·75

NOTE.—The two last columns of this table do not refer to the total number of cows tested, but to the number for which figures are available. The numbers represented in these averages are: North Auckland, 9,489; Auckland, 54,458; Gisborne, 2,026; Hawke's Bay, 1,790; Taranaki, 13,377; Wellington, 22,402; North Island, 103,542; South Island, 3,659; Dominion, 107,201.

THE "GROUP" SYSTEM.

A passing reference may be usefully made here to what is commonly known as the "group" system of herd-testing. This term refers to those associations or dairy companies which engage independent testing officers to visit the farms and take samples and check milk-weights, this usually being done for one day in each thirty days. The cost is necessarily higher than for a method which requires the association member to record his own weights and take his own samples, and the tests may reasonably be expected to evidence more variation from period to period. But there are advantages, among which may be mentioned the fact that the member is relieved of the taking of the milk-weights and milk-samples (which some dairy-farmers consider tedious); some also consider the results more satisfactory on account of their being derived from an independent person.

Last season 43,144 cows were tested on the group system in thirty-four groups, and represented 40·2 per cent. of the cows tested by other than Dairy Division officers. It is a scheme of comparatively recent adoption, but its suitability to certain classes of dairy districts has been well demonstrated. Among the principal groups are those controlled by the New Zealand Co-operative Dairy Company, Hamilton, the first company in this country to try the scheme. Last season it operated twenty-five groups, embracing 32,081 cows.

NOTE.—Thanks are due to those engaged in herd-testing work who supplied annual summaries of results for associations under their control.

IRRIGATION AND ITS PRACTICE.

(Continued.)

V. DRAINAGE.

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GENERAL CONSIDERATIONS.

FROM the references previously made to this subject it will have been realized that drainage, either natural or artificial, is vital to successful irrigation, and most especially to its continued success.

Drainage does not mean merely the removal of excess water from the surface of the land. Such should not generally be necessary on irrigated land if properly graded and not overwatered. It may occur occasionally that irrigation-water will accidentally escape and lodge on the surface of depressions in quantities which would take too long to disappear through the soil. Facilities must be provided for such surplus water to readily run off in surface drains to some place where it will do no harm; but as the provision of such surface drains is obvious and so easily effected there appears no reason to discuss that phase of the question further.

The real meaning of irrigation drainage is sub-drainage, whereby the natural water-table or ground-water level will be prevented from rising too near the surface. In other words, "gravitational" water must not accumulate in the soil, but must be permitted to flow away through the subsoil and eventually find its way to some river or freely flowing stream.

It has been previously pointed out that only capillary water is directly useful to plant-life. From a point of view of economy of water-usage only the ideal practice would be to apply water in just such quantities as would be held in suspension (by capillary attraction) in the few usable feet of soil-depth. If this were possible in actual practice no sub-drainage would be necessary. It is, however, now generally recognized that, even with the most up-to-date methods, it is a physical impossibility to prevent some gravitational water from passing into the deeper layers of the subsoil. Some American writers assert that as much as one-third of the water applied will find its way down by gravity and have to escape through sub-drainage. This will no doubt vary with conditions, but it can safely be accepted that in order to apply enough water to keep a sufficiency of capillary water available throughout the whole of the growing season a very considerable wastage must occur. It must be remembered that this wastage occurs not over the surface of the ground but *through* the soil, and must escape from *underneath* the fields.

It is here appropriate to state that another feature comes in besides the matter of economy of water-usage, and it is now recognized that it is just as well for the soil that a slight wastage of water should pass through it. To explain this in a very simple manner let us imagine a bucket filled with soil, to the surface of which small quantities of water are added each day. All water (other than distilled or rain water)

may be expected to contain minute solutions of injurious salts. If the quantities of water added each day are so small as not to soak to the bottom of the bucket before being held by capillarity and later evaporated, then it is only a matter of time (it may be many years) when the accumulation of all the injurious salts left behind by the evaporating water will render the land sterile. In addition, any initial small quantities of salts which may have been distributed throughout the soil will be brought near the surface and be more harmful through being concentrated. However, let us increase the applications of water, so that each time a little soaks right to the bottom of the bucket and escapes through a hole provided there. Since water is capable of carrying a very heavy solution of these injurious salts, an extremely small quantity escaping from the bottom of the bucket will carry away, in heavy solution, the salts brought in by all the water applied. It will, of course, also carry away a certain quantity of valuable plant-foods, but nature is tending always to replace these, and, in any case, if the land is productive the farmer can afford to replace them artificially. The water which escapes may be regarded as the gravitational waste water from irrigation, and the hole in the bottom of the bucket as the sub-drainage system which must be under the ground to take it freely away.

Thus it will be seen that a certain small waste of water is essential to the preservation of the continued productiveness of the soil, but the latter must have drainage. Over-irrigation by itself will never cause accumulation of alkali, and will actually tend to reduce the alkaline content of the soil; but if accompanied by lack of sub-drainage, then, of course, the more water applied the more alkali will be added to the soil.

These remarks must not be taken as an excuse for over-irrigating fields which happen to possess a free natural sub-drainage. Deliberate over-irrigation is bad practice from every point of view, and particularly because it will leach the soil of its valuable plant-foods. If the irrigator endeavours by the most efficient methods to reduce his water-usage it will still be found that sufficient will gravitate through the soil to carry off alkali.

If natural drainage exists through a deep, free subsoil, then no drainage problems will exist, and, as already stated, this is fortunately the position with respect to the majority of the irrigable lands of Central Otago. However, if natural drainage does not exist, deep canals and drains must be provided to draw off surplus water and thus keep the ground-water level down, so that there may be a slight downward waste of water through the usable upper layers of the soil immediately after each irrigation. It is recognized as the business of the irrigation engineer to satisfy himself as to the natural drainage facilities of the soil, and, where these are not adequate, to make provision for a system of main drainage canals. In order to draw down the general water-table and allow for a subterranean gradient in the ground-water under the adjacent fields, these main canals may have to be fairly deep—10 ft. or more is not unusual.

As an alternative to low-level gravity canals, in some parts of America drainage is being effected by pumping from deep wells sunk at fairly wide intervals throughout the affected areas. These wells collect the ground-water, which, when pumped from them, is either

used again for irrigation or carried away in shallow surface canals. This method would not generally recommend itself in circumstances where the method first described could be provided at reasonable cost, and the writers do not consider its use likely to be warranted in any part of Central Otago.

The waste gravitational water usually takes some time to work down into the water-table of a valley-bottom, and it may therefore occur that the maximum inflow to the general water-table will lag some weeks or months after the period of heavy irrigation. Also, during the warmer period of the year, owing to heavy evaporation from the land, less waste water will go to drainage. On account of these two conditions the ground-water level, if not controlled, is likely to be much higher during the non-irrigating period. In actual practice it is desirable to reverse this state of affairs. This may be readily done by providing lock-gates at intervals in the drainage canals, by manipulating which the land may be deeply drained in winter-time, and have the water-level brought up to within a few feet of the surface in the summer. To guide the operators in the control and regulation of the ground-water level, a series of permanent inspection-pipes should be placed about the affected area. For this purpose perforated pipes may be driven into the ground at occasional points, so that by taking soundings therein the exact water-level may be ascertained from time to time.

In a former article of this series (April last) a warning was given against the dangers of over-irrigation combined with insufficient drainage. It may be added that irrigation of any sort, even under-irrigation, will eventually cause the same damage to the soil if free natural or artificial sub-drainage does not exist. It is, however, fair to state that the irrigator is sometimes blamed for over-irrigating when the cause of the trouble should have been attributed mainly to lack of drainage. In parts of America this fact has only recently been fully realized, after much damage has been done and many settlers ruined. When lands under irrigation deteriorated the one cry was "over-irrigation." In some cases that may have hurried on the destruction, but it is now being asserted by recognized high authorities that very often the cause was simply the continuance of reasonable irrigation practice on lands which had not sufficient sub-drainage facilities, and this assertion is supported by scientific proofs. Many of these American irrigation projects were developed by companies for speculative purposes, without full enough investigation of the natural drainage facilities of the soil. The result was that allowance was not made in the rental charges to settlers to cover the cost of unanticipated drainage systems. When drainage troubles arose, requiring extensive remedial measures, the companies would not face the position, or, remaining ignorant of its true cause, blamed the settlers for over-irrigating. The latter on their part could not deal with it, and thus some settlements gradually became complete failures through the accumulation of alkali. Steps are now being taken in some cases to again reclaim these areas. Adequate deep drainage has to be provided, and then excessive irrigation actually resorted to for the purpose of washing the injurious salts through the soil and conveying them away in the drainage-water.

In the only existing scheme in Central Otago where sufficient natural drainage is not present—that of Ida Valley—the position was realized

by the Government at the outset; in fact, in this case portion of the valley-bottom was already in need of drainage before irrigation commenced. A drainage system for the valley was laid out several years ago, but the owners of the low-lying lands were afraid of being over-drained. It is only now, after a few years of irrigation, that these farmers are likely to view the question of drainage eye to eye with the Government, and thus facilitate the installation of adequate drainage canals.

It is anticipated that generally, in those Central Otago lands which require artificial drainage, the provision of the main canals will suffice without any further work within the individual fields; but if not, then the farmer must give the surplus water under such fields quicker access to the main canals by providing subsidiary drainage. This can be effected by resorting to one or other of the methods here described.

FIELD-DRAINAGE METHODS.

Open Ditches.

Open ditches dug to a depth of 2 ft. to 3 ft. and of varying width are very often utilized for draining farm-land. On some soils, such as peats, this system is the only practicable one, on account of the manner in which such soils consolidate and sink from year to year. As described later, open ditches also are very effective in cutting off water which has been brought to the surface by an outcrop of hard-pan. Drains of this nature are, of course, much cheaper to construct than under-drains, but they have certain disadvantages which mitigate against their practical utility. The chief of these is the fact that they occupy a portion of the land in such manner that it cannot be utilized, and also render the construction of culverts necessary to permit of farm traffic. The cleaning-out of such ditches becomes a costly and recurring undertaking, and it frequently happens that this cleaning is neglected, thus encouraging the growth of weeds, which, if allowed to grow unchecked, quickly spread over the adjacent land. The damage by stock to the banks is also a source of trouble, and stout double fencing may be necessary in order to prevent their slipping into a deep ditch from which they may be unable to extricate themselves.

While the Central Otago irrigation farmer may in certain cases find it an economic proposition to dig a number of open ditches in certain portions of his farm, generally speaking it will be a more efficient and profitable undertaking to provide those fields requiring drainage with a proper system of under-drains.

Tile Drains.

The most satisfactory and permanent system of under-drainage which can be adopted is undoubtedly that of using unglazed porous clay tiles.

An outlet, such as a creek or drainage canal, is the first essential for carrying off the surplus water. Having secured a suitable outlet, the next important consideration is the grade of the ditch. This will, of course, be regulated by the fall of the land, but it should be borne in mind that a grade of 1 in 500 is the least permissible in

an ordinary tile drain. A greater fall than this, however, can usually be obtained, and it is desirable that a good fall should be allowed for, so that comparatively small and relatively cheap tiles may be utilized. If a fall of 2 in. or more in 100 ft. can be obtained the conditions may be regarded as quite favourable for successful results. It sometimes happens that a smaller fall has to be accepted, but this should be only after careful levelling has proved a greater one impracticable. In some instances the line of lowest ground is quite tortuous, making the distance from highest to lowest point greater than if following a straight line. In such a contingency and where the fall is very small it may be desirable to excavate to a greater depth in places, cut off bends, and so obtain an increase in the fall.

Speaking generally, it may be accepted that the main drain should follow the lowest line in order to secure as great a fall for the laterals as possible. The laterals which lead into the main drain on either side

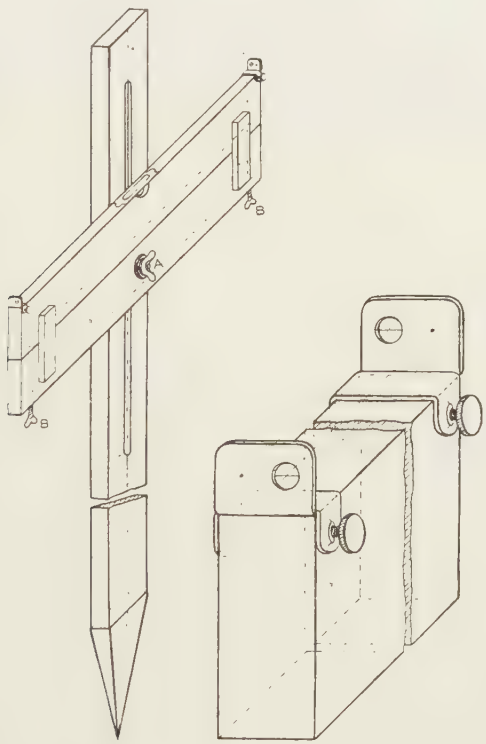

FIG. 1. DEVICE FOR TAKING DRAINAGE LEVELS WITH A CARPENTER'S LEVEL FITTED WITH PEEP-SIGHTS.

The slotted stake is driven into the ground, and the level roughly adjusted and clamped into position by screwing up at A; for finer adjustments the thumb-screws at BB are used. The right-hand drawing shows the peep-sight arrangement on a larger scale.

[*Connell and Hadfield—"Agriculture."*

should be so arranged that no two will join the main drain opposite one another; and where they do join the main they should be acutely angled, so that the discharge from the lateral will to a certain extent be directed in the same direction as the flow in the main drain. This will prevent the water in the main drain from backing up into the laterals and thus preventing the proper drainage of that portion of the field.

The utmost endeavour should be made to get a perfectly level fall for the whole main and in the whole length of each lateral, and when the tiles are laid the greatest pains should be exercised in laying them perfectly true to the grade. Where this is done, and the ends of the tiles are brought close together, there is little likelihood of much sediment lodging in the drain. Before digging any ditches it is necessary to map out the course of the main drains and chief laterals. This can best be ascertained by the use of a proper level and graduated staff, taking readings from pegs driven into the ground about every 100 ft. apart along the proposed course of the drains. By this means the fall of the land can be ascertained over different sections of the ground, and the grade most suitable for that particular main or lateral can be fixed upon. Many home-made devices have been quite successfully used for taking drainage levels, such as a carpenter's level adapted as shown in Fig. 1, but great care must be exercised in using them if true levels are to be obtained.

Where the grade or fall of the drains has been decided upon by aid of a level, it remains to dig the ditch to the grade in question. A simple method of doing this is by the use of what is termed a span-level or triangle (Fig. 2). To construct this three narrow strips of board are required, each about 6 ft. in length; these are nailed together in the form of the letter A, the span being exactly half a rod. From a pin at the top a plummet is suspended. The span-level is then placed, for the purpose of marking, upon a floor or piece of timber, which must be perfectly level, and the place where the plumb-line touches the cross-bar is marked; one foot is then raised $\frac{1}{4}$ in., and the place where the line touches the cross-bar again marked, and this will show a rise or fall of $\frac{1}{2}$ in. to the rod. These markings can be made to any extent desired, and by dropping the instrument into the drain occasionally it will show if the drain is dug with a uniform fall and precisely that determined on at the outset of the digging operations.

Another method of obtaining the same result is known as the overhead system. In this method a number of cross-pieces are erected at short intervals, as shown in Fig. 3. The first cross-piece is driven in either at the outlet of a main drain or where a lateral meets a main drain. This peg is driven in so that the cross-arm is at a height of, say, 2 ft. above the level of the ground, and the arm is then trued up by a spirit-level. The next peg to be driven in will have its cross-piece exactly that number of inches higher than the first cross-piece that there is in the fall or grade of that particular section. This will be the case with each peg driven in at regular intervals along the proposed ditch. When a sufficient number of cross-pieces have been accurately driven into position a line is then drawn tightly over the arms. With this line as a guide no difficulty will be experienced in digging the ditch to a required depth. If the depth

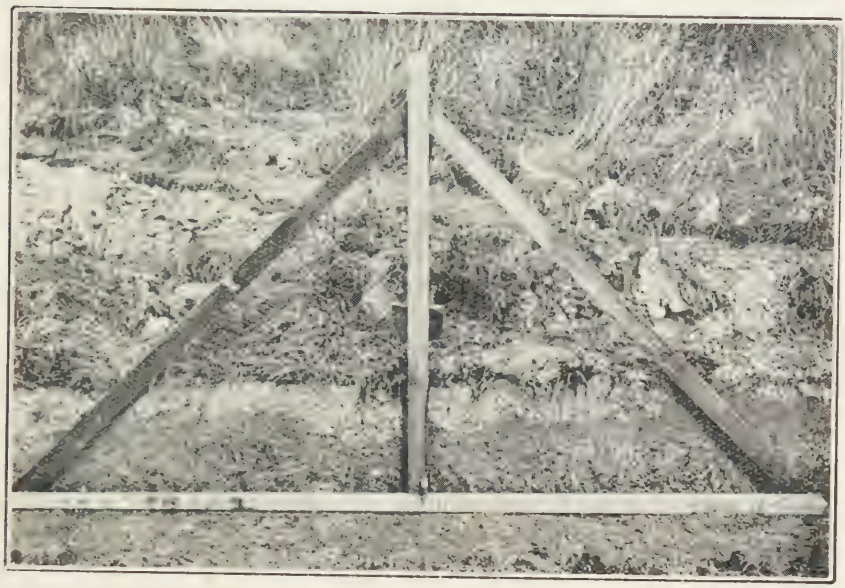

FIG. 2. SPAN-LEVEL. (SEE OPPOSITE PAGE.)

FIG. 3. OVERHEAD SYSTEM OF OBTAINING DRAIN-LEVELS.

of the ditch is to be, say, 3 ft. a measuring-stick 5 ft. long will be required, and no difficulty will be experienced in digging the bottom of the ditch 5 ft. from the line in the cross-pieces.

It is not always practicable to maintain a ditch at a constant gradient, and where such is the case it is advisable to change from a less fall to one which is greater. By doing this any sediment carried in the upper part of the drain will also be carried in the drainage-water when the fall is increased. With reverse conditions, silting of the drains would probably occur.

The digging of a drain-ditch requires considerable skill if it is to be done properly, and proper draining-spades and tile-laying tools are necessary for the purpose.

It is impossible to give specific directions for selecting the sizes of tiles which are most suitable, except where all details regarding the land to be drained are known. The size of the main-drain tile will vary from 6 in. to 12 in., according to the grade. It will be appreciated that where the grade is slight or the catchment area large the diameter of the tiles must be proportionately large. The quantity of water which the drains have to carry will also be an important factor in determining the size of tiles. In actual practice for Central Otago conditions it will be found that 3 in. tiles for laterals and 6 in. tiles for mains will most generally be adopted. The use of tiles less than 3 in. diameter is not to be recommended, on account of their liability to become silted up. The distance apart at which to lay drains varies according to the nature of the soil and the amount of water to be removed. Generally speaking, the drains will be about 40 ft. apart in heavy soils and nearly double that distance in lighter soils. In depth the drains will vary from 2 ft. 6 in. in heavy soils to 5 ft. in lighter soils.

In these short notes on tile drainage only an indication is given of the procedure to be adopted. Settlers who intend draining portions of their farms are recommended to become thoroughly acquainted with the best manner of carrying out the work, either by consulting one of the many books dealing specifically with the subject, or, better still, by assisting an experienced drainer in actual drainage operations.

Stone, Scrub, and Box Drains.

Apart from tile-draining, there are a number of other methods of carrying out under-drainage by the utilization of various materials. Some of these may be briefly noted as follows :—

Stone drains : Stone drains are formed in two ways, one of which consists of placing stones in the bottom of the ditch so as to secure a clear watercourse. The other method is to partially fill the drain with small stones, allowing the water to find its way between them. In portions of Central Otago there is an abundance of suitable stone for drains of this nature, the flat slabs of mica-schist being particularly adapted for such a purpose. A good water-way may be obtained either by placing a stone on each side of the bottom of the drain and laying a flat stone upon them, or by setting a flat stone upon edge on one side of the drain and leaning

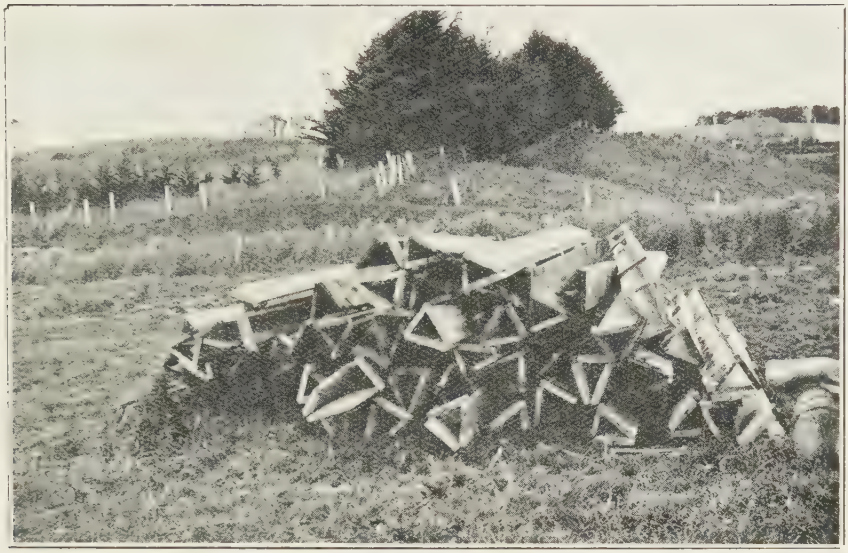

FIG. 4. WOODEN BOXES FOR UNDER-DRAINING.

another flat stone against it from the other side. In either method care should be taken to cover well with more stones all the spaces through which sand or earth might pass to obstruct the drain. In this manner many troublesome stones on the farm can be disposed of to great advantage. Drains of this nature, however, have the great disadvantage that they are liable to become choked up with silt, and in the course of time will require relaying.

Scrub drains: In some districts under-drains are often constructed by placing bundles of good-sized manuka in the bottom of the ditch, which is then covered in with soil. In Central Otago, however, scrub of any nature is absent.

Box drains: Another type of drain is constructed by means of Λ-shaped wooden boxes with two sides, the latter being held together by light cross-pieces at intervals (Fig. 4). When durable timber is used, drains of this type may last for a considerable period of years.

Dealing with an Impervious Stratum.

In the foregoing notes it has been assumed that the soil is homogeneous to the full depth required from the surface to the safe ground-water level. If, however, a stratum or pan of impervious material exists between the surface and the general water-table quite a different problem arises. If the pan is very near the surface, but cannot be permanently broken up to pass a little drainage-water, the land will be quite unsuited to irrigation, unless on a decided slope. In the latter case the drainage will travel down the slope on the pan, but care must be taken that at some lower part of the slope the accumulated drainage from the pan does not become so excessive as to saturate the whole of the overlying soil and come out on the surface.

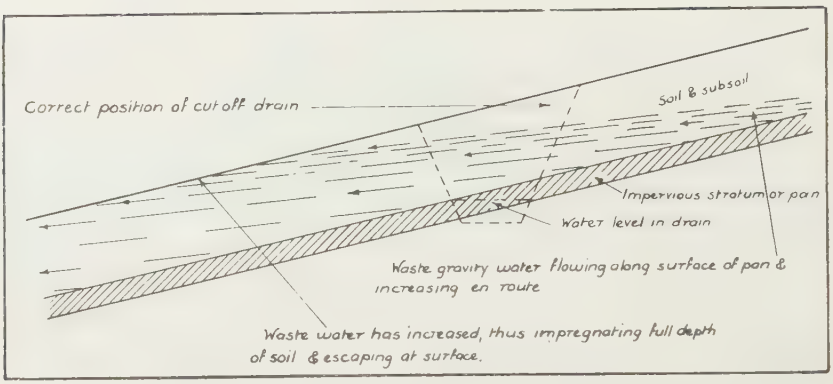
Correct position of cut-off drain
Soil & subsoil
Impervious stratum or pan
Water level in drain
Waste gravity water flowing along surface of pan & increasing en route
Waste water has increased, thus impregnating full depth of soil & escaping at surface.

FIG. 5. SKETCH SHOWING METHOD OF CUTTING OFF SUB-DRAINAGE FROM UNDERGROUND IMPERVIOUS STRATUM ON SLOPE.

[*Original.*

This condition can be remedied by cutting a drain across the slope of the land just before where the drainage-water would come out on the surface (Fig. 5). The drain should in this case be cut deep enough so that the water surface in it will be below the top of the impervious strata and thus effectively cut off the onflow down the slope. For ascertaining the depths and correct locations for such drains, preliminary inspection holes must be dug or bored with a post-hole borer. If desired, the open drains in this case may be replaced by buried tile drains or stone filling situated where the bottom of the open drain would have been.

(To be continued.)

METAL-BOUND BUTTER-BOXES.

THE article entitled "Butter-boxes and their Design," published in last month's *Journal*, has attracted considerable attention. As permission has been granted to several dairy companies to make experimental shipments of wire-bound butter-boxes this season, a number of inquiries have been received regarding the use of wire bindings in place of flat metal straps.

The wire-bound box which is being allowed for shipment requires $\frac{3}{8}$ in. sides, top, and bottom, and $\frac{1}{2}$ in. ends, with at least five nails per nailing-edge. In confirmation of the statement which appeared in last month's article to the effect that the ends were the weakest parts of the box and might require to be completely redesigned, advice has since been received from Britain that $\frac{5}{8}$ in. ends are advisable. At least two wires of the largest size which can be efficiently applied by the system used should be employed, located similarly to the flat metal straps.

While this wire-bound package is slightly stronger than the old type of package, it should be realized that it is less satisfactory than the flat metal-strapped package already specified. This is due to the fact that the wire binding is not capable of maintaining the tension in the metal as well as the flat strapping, and the binding may therefore hold the package together merely as a bundle. In the first place, the wires cut so badly into the edges of the box that the tension given by the springing of the sides is soon lost. Secondly, where the system uses a joint made by twisting the wires together it is usual to employ annealed metal, which is much weaker than unannealed metal, and is also liable to stretch considerably and so relieve the tension in the wire.

THE GROWING OF ELECTRIC-TRANSMISSION OR TELEGRAPH POLES.

TREE SPECIES RECOMMENDED FOR FARM FORESTRY.

H. A. GOUDIE, Conservator of Forests, Rotorua.

THE past five years may be regarded as epochal in the history of forestry in New Zealand. During that time there has been a remarkable, widespread public interest in the subject; five million trees have been distributed from the State nurseries and planted mainly by farmers, and there is an insistent demand for information regarding the respective merits of the introduced trees. The necessity for and the advantages of planting the waste places on a farm with trees seems to be now more generally understood, and if the present enthusiasm is maintained and directed along sound lines the results will be highly profitable to the individual farmers and to the Dominion as a whole. While the primary object may be to obtain shelter for buildings and farm-animals, it cannot be too often reiterated that this object can be attained, in the majority of cases, just as well with the valuable timber-yielding species of trees as with those having a shelter value only. Admitting the truth of this statement, then the object becomes twofold, and it only remains to choose a species of tree which will produce the class of timber required.

In the notes which follow upon the various trees suitable for the production of poles the writer has had in mind the great development which has taken place in the production and use of electricity both for lighting and power purposes, and the very large demand likely to exist in the future for poles for the extension of this work and for renewals. So far as it is possible to judge, a crop of poles upon maturity should be highly remunerative. The existing power-lines and those contemplated within the near future are estimated to require forty thousand poles per year for renewals, the value of which may be set down at £100,000. Outside of this, the extension and renewals of telegraph and telephone lines which has to be provided for indicate an extensive demand for timber of this class. In short, it may be safely assumed that, as the readily available supply of our native timbers becomes reduced, any timber, particularly the strong and durable kinds, will become valuable.

EUCALYPTS.

The main qualifications required of a pole are strength and durability. For high-tension electric-transmission poles these qualities are of the greatest importance, because of the high cost of renewing decayed poles and the great danger to life which would result should the line break down. For these reasons it is customary to use poles of the highest quality, and on most of the high-voltage lines throughout New Zealand Australian ironbark poles of the following species have been used: Grey or white ironbark (*Eucalyptus paniculata*), broad-leaved ironbark (*E. siderophloia*), narrow-leaved ironbark (*E. crebra*), and red ironbark (*E. sideroxylon*). For telegraph-lines and electric

reticulation work the factor of safety required is considerably lower; smaller poles may be used, although durability is as desirable a quality as in the high-voltage lines. The qualities of strength and durability are found combined in some of the eucalypt timbers more than in any timber in general use, and therefore they may be regarded as having first claim to attention in this article. An endeavour has been made to deal with the species here described in their order of merit.

IRONBARKS.

The ironbark group have hard, rugged, and furrowed bark. The presence of small grains of resin give it a gritty feeling when rubbed between the fingers. It contains practically no fibres, and can be readily pulverized.

Eucalyptus paniculata (White or Grey Ironbark).—The habitat of this, the strongest of the ironbark timbers, is chiefly the coastal districts of New South Wales and southern Queensland. It is generally found growing on ridges and on dry, poor land. It is usually a tree of medium size—60 ft. to 70 ft. in height, with a diameter of 2 ft. to 3 ft.; occasionally larger specimens are found. Ironbark has been described as "the king of New South Wales hardwoods" from the fact that it is excelled by no other timber in Australia for combined strength and durability. It is extensively used for bridges, railway-sleepers, vehicle-construction, warehouse buildings where large strong beams are necessary, poles for telegraph and electric-transmission lines —in short, for any purpose where durability and great strength are needed.

The white ironbark can be recommended for growing only over a comparatively restricted area in the warmest parts of New Zealand. Good specimens may be seen in the old Wesley College grounds, Three Kings, Auckland, where they were planted by the Rev. J. H. Simmonds. At Puhipuhi Plantation, in the Whangarei district, at an altitude of 1,200 ft., ironbarks have been disappointing, which seems to indicate that this species prefers warmer, less exposed sites at a lower altitude. The species has also been found in the colder parts of the Waikato district and as far south as Tarukenga, on the Rotorua line, but in every such case the trees are stunted and of no commercial value. Although the evidence available is certainly not large, it may be safely assumed that this species can be satisfactorily grown to merchantable-timber size in warm sites in the upper Waikato, North Auckland Peninsula, Bay of Plenty, and probably Hawke's Bay. Its high value as a timber makes it well worth experimenting with in the districts mentioned.

Eucalyptus sideroxylon (Red Ironbark).—The habitat of this species is in New South Wales, Queensland, and the northern part of Victoria, but it is much more widely distributed than *E. paniculata*, occurring beyond the Blue Mountains and in the interior. It is usually found on poor, sterile ranges. It attains a height of 100 ft. and a diameter of 4 ft., though usually it is much smaller. The timber is used for purposes similar to those given for the white ironbark, from which it differs chiefly in having darker and less strong timber. The red ironbark appears to be less intolerant of cold than the white species.

Good trees have been observed at Cambridge, in the Waikato district, and good specimens are fairly common in the upper Waikato generally. It can be recommended for planting in the districts mentioned for the white ironbark.

Eucalyptus siderophloia (Broad-leaved Ironbark).—An inhabitant of the coastal ranges in New South Wales and Queensland, where it becomes a large tree of 100 ft. in height and 4 ft. in diameter. It has not as good a reputation for durability as the white ironbark, but the timber is extensively employed for the same purposes. The writer has not come across any specimens of *E. siderophloia* growing in New Zealand, but is of opinion that it is likely to prove satisfactory if planted in the districts recommended for the white ironbark.

Eucalyptus crebra (Narrow-leaved Ironbark).—This species is widely distributed throughout New South Wales and Queensland, and generally attains dimensions similar to those of the broad-leaved ironbark. It has a strong and durable timber. The only experience the writer has had of this tree in New Zealand is with specimens planted at Puhipuhi, where its growth was slow and generally unsatisfactory. It is likely to succeed only in the warmest parts of the North Island.

BOXES.

The group of eucalypts known as "boxes" have a fibrous bark, generally light grey in colour, compact, with the furrows only moderately deep. In Australia the boxes are generally regarded as second only to the ironbarks for strength and durability. Any of the two species here mentioned can be successfully grown in the warmer parts of the Auckland, Bay of Plenty, Poverty Bay, Hawke's Bay, and Taranaki districts.

Eucalyptus hemiphloia (White or Grey Box). — Occurs in Queensland, New South Wales, Victoria, and South Australia, from the coastline away into the dry interior. Grows from 60 ft. to 80 ft., with a diameter of 1 ft. to 2 ft. The timber is tough, hard, cross-grained and not easily split, and very strong and durable. Used for railway-sleepers, poles, piles, girders, coachbuilding, &c. The only place in New Zealand where it has been observed growing is near the Town of Whangarei, where it is not only thriving but regenerating freely from seed.

Eucalyptus goniocalyx (Mountain-gum).—Found in the mountainous parts of Victoria and New South Wales, where it sometimes becomes a large tree of 200 ft. in height. Timber strong and durable, suitable for bridge-building, girders, poles, dray-shafts, and similar purposes. Good specimens have been found growing in the Foxton, Putaruru, Rotorua, and Matamata districts. It is, however, somewhat slow-growing in these parts, and is better suited for the warmer districts previously mentioned.

STRINGYBARKS.

The barks of this group have strong, long fibres, which intertwine and cross-lattice, forming more or less deep furrows, and are generally light grey in colour.

Eucalyptus eugenioides (White Stringybark). — In Victoria, New South Wales, and Queensland this species is found chiefly in the

mountains. It grows to a medium size, rarely exceeding 80 ft. in height. The timber, which, when dry, is of a pale reddish-brown colour, is used for fencing, railway-sleepers, street-blocking, and general building purposes. It is much softer and more easily worked than ironbark, yet is strong and durable. This species is commonly found throughout the Waikato, and has proved hardy in warm sites at

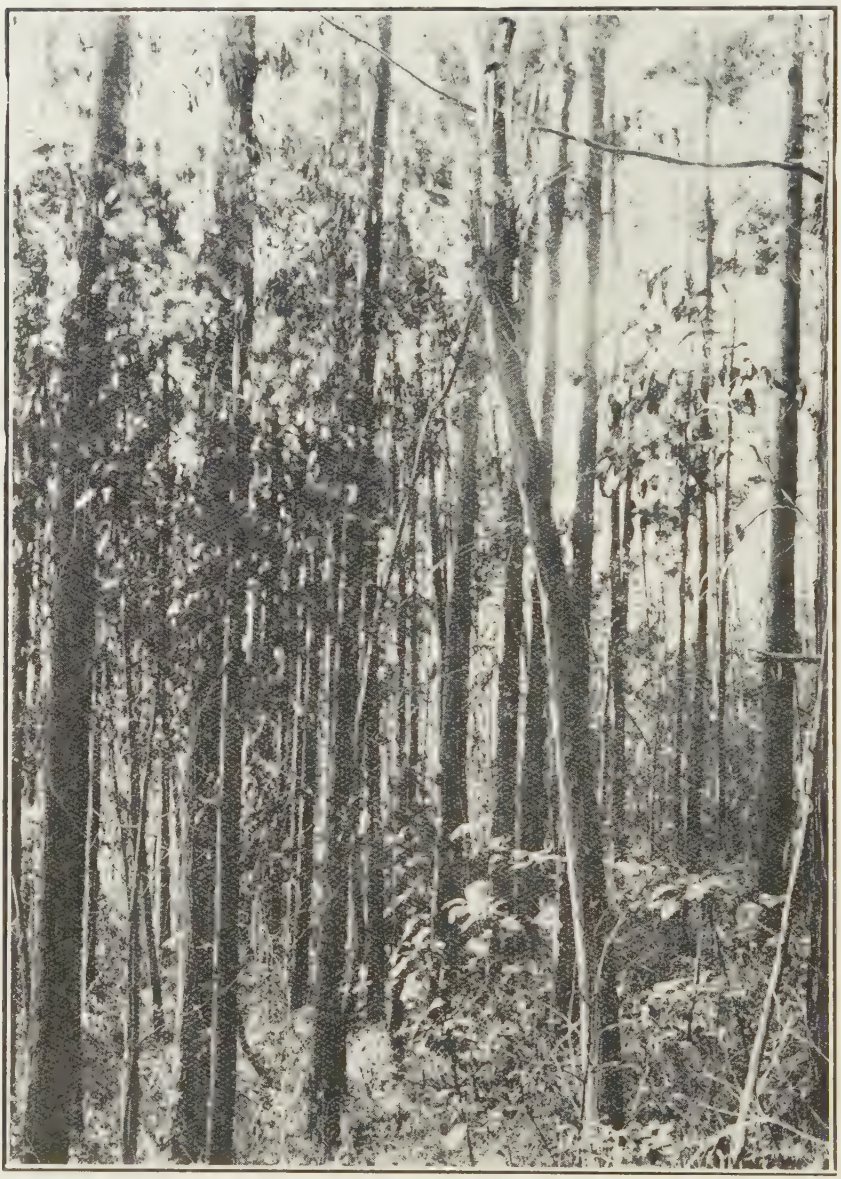

FIG. 1. A FINE PLANTATION OF STRINGYBARKS.

Rotorua. It is not a large-growing tree, and is generally found in ideal pole dimensions—a small girth and gradually tapering trunk free of large branches. Many instances might be quoted regarding the durability of the New-Zealand-grown white stringybark. It has given most satisfactory service as fencing-posts. Electric and telephone poles erected at Horotiu are still giving good service, and a flagpole erected at the Leamington School many years ago is still in a sound state. All evidence available goes to show that the durability of this timber is a well-established fact. It makes heartwood early in life, and, although a comparatively slow grower, its value as a pole timber cannot be questioned. It is hardier over a much wider range than any of the ironbarks, and will probably be found suitable for growing in any part of the North Island except the coldest and most exposed districts. In the South Island it will probably succeed in the warmer parts of Nelson and Marlborough.

Eucalyptus Muelleriana (Yellow Stringybark).—A tree of the mountains in South Australia, Victoria, and New South Wales, where it attains fairly large dimensions—80 ft. to 100 ft., with a diameter of 3 ft. Australian experience goes to show that this species produces a strong and very durable timber. It is extensively used for general building purposes, fencing, and wharf-construction. The yellow stringybark is not frequently met with in New Zealand, the writer's experience being confined to specimens found growing at Tauranga and at Rotorua. Like the white stringybark, this tree grows to ideal pole dimensions, but it is apparently more susceptible to cold conditions than that species. It may with certainty be recommended for planting in the warmer parts of the North Island. No information regarding the qualities of the New Zealand product is available.

VARIOUS SPECIES.

In the foregoing descriptions only those species which by their natural habit of growth produce well-proportioned poles have been dealt with. There are many other species of eucalypts, however, which produce durable timbers—in fact, the heartwood of most species is durable in contact with the ground, and most of them are strong timbers. Some of these, while fulfilling the conditions regarding strength and durability, make a large girth-growth and produce a log which could be converted into a pole only by sawing or hewing down to the right proportions. Climate and soil conditions, however, have a considerable influence upon the growth and shape of a tree, and where these conditions are such as to make the rate of growth slow a tree may produce a satisfactorily proportioned trunk to fit it for use as a pole. The species hereunder described are recommended for pole-growing, subject to these reservations:—

Eucalyptus pilularis (Black-butt).—Found in the coastal districts of New South Wales, Victoria, and Queensland. This is one of the largest of the eucalypts, a tree with a height of 156 ft. and 23 ft. girth having been recorded. The timber is strong, durable, and largely used for house and ship building, bridge-planking, wood-paving, and railway-sleepers. The species has not been planted to any great extent in New Zealand, but flourishing specimens have been found at Karaka (Auckland) and at Napier. It is somewhat tender

in the seedling stage, and strong plants should be employed when planting. It can be recommended for planting in the warmer and least exposed parts of Auckland and Hawke's Bay Provinces.

Eucalyptus saligna (Blue or Flooded Gum).—Confined to New South Wales and Queensland, where it is a coastal and coastal-range tree. Size, 150 ft. high and 3 ft. to 4 ft. in diameter. The timber has a reputation for durability and strength, and is extensively used for general building purposes, ships' planks, and felloes for wheels. Many fine specimens of this tree are to be found in the Waikato district, in the vicinity of Hamilton. It has also been noted growing well at Auckland, Whangarei, Thornton (Bay of Plenty), Levin, Bull's, and in warm sites at Rotorua. It appears to be slightly less susceptible to cold than *E. pilularis*, and, as will be seen from the places where it has been found growing, it is likely to succeed over a fairly large range in the North Island.

Eucalyptus botryoides (Bangalay).—Confined to eastern and south-eastern Australia; not occurring far from the sea. A smaller-growing tree than *E. saligna*, and much like that species in appearance, except that, whereas the former has a smooth bark, this has a thick rough bark, red in appearance, and much like that of the Californian redwood. The timber is light red in colour and durable. The species will grow in the same districts as those recommended for *E. saligna*.

HARDIEST SPECIES.

The undermentioned species are included because of their ability to withstand cold conditions and their probable usefulness in parts of the South Island.

Eucalyptus Gunnii (Cider-gum).—This is indigenous to Tasmania, and is a somewhat small-growing tree, 60 ft. in height, with a diameter of 2 ft. Tasmanian authorities describe the timber as pale-coloured and very hard and heavy, but not quite so hard as that of the white ironbark. *E. Gunnii* is probably the hardiest species of eucalypt introduced into New Zealand. It is a fairly common tree in Southland, where it has withstood the cold much better than the common blue-gum. It has also succeeded well in the State plantations at Waiotapu, where winter temperatures as low as 15° F. are not uncommon. The tree grows to good pole dimensions, and can be recommended for planting in the colder parts of New Zealand where other species of eucalypts cannot be grown.

Eucalyptus Macarthuri (Camden Woolly-butt).—So far as is yet known, the habitat of this species is confined to New South Wales. It frequents medium-cold localities, its usual range being from 2,000 ft. to 3,500 ft. altitude; prefers wet or low-lying land, or to follow the course of a stream. Height, 40 ft. to 80 ft.; diameter, 3 ft. to 4 ft. In its native home this species is not seriously regarded as a good timber-tree, and it is planted only for the production of the valuable oil contained in its leaves and young bark. Experience in New Zealand has shown that this species is well worthy of cultivation. In suitable localities it quickly grows into a large tree, sometimes over 100 ft. in height, with a diameter of from 3 ft. to 4 ft. The durability of the timber has been well proved. At Cambridge the

writer has seen miles of fencing constructed with posts split from twenty-year-old trees which still are sound after twenty-five years' service. Heartwood is formed early in the life of the tree, and consequently a thirty-year-old specimen has generally not more than about 10 per cent. of sapwood. The timber, however, has a serious fault in that it seasons badly in the log, deep radial cracks appearing after a few days' exposure to the sun. This fault might be overcome to some extent if the trees were ringbarked, say, twelve months before felling.

This species has been noted growing successfully in the Waikato, Rotorua, Bay of Plenty, and at Paekakariki (near Wellington). It can be recommended for planting in most parts of the North Island, except in the high, cold, inland parts. It has not been very successful in the vicinity of Auckland or in North Auckland in situations exposed to the westerly winds, and in these parts it should be planted only in good moist soil and in sheltered valleys. The hardy qualities of this tree indicate the probability of its successful culture in the warmer parts of the South Island—say, in Nelson, Marlborough, and Canterbury. Although, on account of its bad seasoning-qualities, the Waikato-grown *E. Macarthuri* does not appear to be suitable for pole-production, the undoubted durability of the timber, combined with the fact that the tree is hardy, recommend its planting in climates where other better and less hardy species cannot be grown.

Eucalyptus viminalis (Manna-gum).—This species is found in Tasmania, Victoria, and South Australia, where it usually develops into a wide umbrageous tree which is not generally regarded as suitable for timber-production. Like many other introduced trees, the manna-gum has changed its habit in New Zealand, and here is generally seen as a tall clean-stemmed tree reaching sometimes to a height of 100 ft., with a diameter of 2 ft. to 2 ft. 6 in. The bark is smooth and bluish-white in colour, and gives the tree a distinctly conspicuous and picturesque appearance. It grows well in cold localities, and has been noted in many parts of the Waikato, at Rotorua and Waiotapu, and in the Manawatu, Hawke's Bay, Nelson, and Canterbury districts. In the Waikato, where perhaps it has shown more rapid growth than elsewhere, the timber has been much used for fencing-posts, for which purpose it has proved satisfactorily durable. The logs, however, split very much in seasoning, and for this reason pole timbers are not usually easily obtainable from it. It is probable that slower-grown timber would prove more satisfactory in this respect. The hardy qualities of this species and the moderate durability of its timber point it out as one suitable for cultivation in the warmer parts of the South Island. It is not recommended for planting for pole-production in the North Island, where many other better species can be grown.

CONIFERS.

Thuya plicata (Western American Red-cedar).—This tree is found over about 300,000 square miles on a region extending from the south-east coast of Alaska, through British Columbia, Washington, Oregon, and North California. It is a tree of the coast and coastal

ranges, and is confined to regions of abundant rainfall and humidity, in chiefly wet or constantly moist situations. It grows into a large tree, 100 ft. to 150 ft. high and 3 ft. to 8 ft. diameter; exceptionally 200 ft. high and 16 ft. diameter. The wood is light, reddish-brown in colour, soft and easy to split, and of great durability. It is extensively used for shingles, is the chief pole timber in the United States, and is used for interior and exterior parts of buildings, joinery, patternmaking, tubs, buckets, and tanks.

The red-cedar is not an uncommon tree in New Zealand, and specimens may be found in most public gardens and parks. Cold conditions appear to suit it better than warm ones, and a humid atmosphere better than a dry one, while atmospheric humidity is as important as soil-moisture. Suitable conditions may generally be found throughout the interior of the North Island, at altitudes, say, from 1,000 ft. to higher. In the South Island suitable conditions will probably be found at lower altitudes. Localities in which the soft-fronded ferns are found in the native bush may generally be regarded as favourable for the growth of this tree. It is very tolerant of shade and can be grown interplanted in the native bush, but in such situations its growth is likely to be slow.

Sequoia sempervirens (Redwood).—The habitat of this tree is restricted to a comparatively small territory in the States of Oregon and California, where it is found as a coastal tree never distant more than thirty miles inland, and at elevations from sea-level to 2,500 ft. It is a very large-growing tree, exceptional specimens 350 ft. high, with a diameter from 18 ft. to 20 ft., having been measured. The timber is light, soft, moderately strong, and very durable in contact with the soil. It is extensively used for joinery, general house-construction, interior finish in railroad-cars, tanks, vats, flumes, conduits, shingles, railway-sleepers, posts, and poles. Specimens of redwood have been noted in almost every part of New Zealand. It thrives best, however, where the rainfall is above 30 in. a year and well distributed, and where the atmospheric humidity is high. It should not be planted in exposed sites, as the tops of the trees are easily broken off by strong winds.

Cupressus Lawsoniana (Lawson's Cypress or Port Orford Cedar).—The native home of this tree is a restricted range in south-western Oregon and North California, where it extends from sea-level to an altitude of 5,000 ft. and from ten to forty miles inland. Like all the trees from that part of the world, Lawson's cypress requires a climate characterized by moderate temperatures, heavy precipitation, high humidity, and many cloudy days. Its height is from 125 ft. to 180 ft.; diameter, 3½ ft. to 6 ft. The wood is fine-grained, hard, firm, and easily worked, and is very durable in contact with the soil. It is one of the most valuable of the North American timbers, but, owing to the limited supply, it has there not been used much outside of the restricted region in which it is found. Lawson's cypress has been extensively used for ornamental planting throughout New Zealand, and has adapted itself to a wide variety of soil and climatic conditions. It succeeds best, however, in moist land, provided the drainage is good; atmospheric humidity is also very necessary. It is perhaps not so exacting as *Thuya plicata* in respect to humid conditions, but, in order

that it may reach its best size, situations approximating those recommended for the *Thuya* should be chosen.

Pseudo-tsuga Douglasii (Douglas Fir or Oregon Pine).—This well-known tree came from western North America, where it occurs over a wide range from British Columbia to California. Under the best conditions it reaches a height of 180 ft. and a diameter of 3 ft. to 6 ft.

FIG. 2. SHOWING IN CENTRE OF PHOTO A WESTERN AMERICAN RED-CEDAR (THUYA PLICATA), HEIGHT 50 FT., GIRTH 5 FT., AGE 25 YEARS.

FIG. 3. A 22-YEAR-OLD PLANTATION OF LARCH AND CALIFORNIAN REDWOOD.

The two middle trees in foreground are: To left—European larch, height 48 ft., girth 2 ft. 8 in.; to right—Californian redwood, height 48 ft., girth 3 ft. 11 in.

The timber has a well-known commercial value for general constructional purposes. It is also used to a large extent by railway and telegraph companies for telephone and telegraph lines and signal wires, and for electric-tram poles, bridge-timbers, and paving-blocks, for all of which purposes it is usually treated with creosote or zinc chloride as a preservative. Grown under proper forest plantation conditions, Douglas fir develops a tall tapering pole, which is of light weight and comparatively strong. It produces durable heartwood early in life, but the sapwood is not durable in contact with the soil unless it receives preservative treatment. The splendid straight poles which it produces, and the probability of the development of timber-preservation in the comparatively near future, indicate a wide use for this timber for transmission-line purposes.

Douglas fir may be seen thriving well in most parts of New Zealand. It does best, however, in a cool climate, in moist, well-drained soil and humid atmosphere. Hot, dry conditions, such as prevail in the clay lands in part of the Auckland Province and in the drier parts of Hawke's Bay, Marlborough, and Canterbury, result in the tree making poor and unhealthy growth. It stands a fair amount of exposure to strong winds, but the saline winds prevalent on the west coast of the Wellington Province periodically injure the foliage.

Larix Europaea (European Larch).—This tree is indigenous to the Alps and the Carpathian and Moravian Mountains of Europe, where it is mostly found at from 3,000 ft. to 6,000 ft. elevation. Under average conditions it reaches a height of 80 ft. to 100 ft., with a diameter of 18 in. to 24 in. The timber, which is moderately heavy and strong, is used in Europe for railway-sleepers, mining purposes, and poles. It is, however, customary to treat the timber with a creosote preservative. Larch can thrive in a much lower mean annual temperature than any other of the trees described in this article, and may therefore be useful for planting in some of the cold uplands of the South Island. Although able to resist very cold weather, it is rather susceptible to late spring frosts, which may injure the early spring growth. It should therefore be planted on the slopes of hills where the drainage is good. Larch has proved a good grower on the hill country at Hanmer Springs and throughout the hills on various parts of Canterbury and Otago. In the North Island it has grown well at Rotorua and Waiotapu, but, generally speaking, has not been a success at elevations lower than 1,000 ft. It may be recommended as a good tree to plant where the climate will not permit the growing of any of the eucalypts.

GENERAL.

While the primary object of the foregoing article is to deal with the growing of trees for pole-production, a sufficient description has been given of the quality and uses of the timbers to show that the species in question produce timbers suitable for a variety of purposes. Several of these species can rightly be specified as among the best of the world's timber-trees, and are worthy of inclusion in any plantation scheme. Provided that a good tree is chosen and planted in an environment which suits it, it will ultimately produce timber which will be sure to find a ready and profitable market.

TESTING OF NEW-ZEALAND-GROWN WHEATS.

II. QUALITY OF FLOURS FROM SOME RECENT SAMPLES.

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In the *Journal* for June last the milling-qualities of some forty-four samples of wheats, representing a fairly wide range of varieties, were discussed and the results summarized. The flours obtained from these wheats have now been examined; the quality of the different samples, and their probable behaviour when baked into bread, are indicated in the following matter.

All the flours in question were allowed to mature for not less than four months. Storage of both wheat and flour for a few months increases their capacity for the absorption of water, and results, in the case of flour, in a marked improvement in colour. Where the conditions are favourable, storage for quite lengthy periods of time, extending perhaps to years, has a most decided effect on strength or baking-quality; improvement in volume, texture, and shape of the baked loaf generally results.

The same varieties of wheat differ fairly widely in appearance when grown in different environments, but no obvious mistakes have been noticed in the naming of varieties. The names of the samples are given as received at the Laboratory, and it is thought that they are reasonably reliable in this respect.

The weight per bushel is, for purposes of comparison, again included in the table of results (page 256), but it will be noticed that there is no general correlation between such weights and the quality of the grain.

The question of the colour of these experimental flours has been investigated in this series. It is impossible, of course, in a model mill to clean the wheat as thoroughly as is done with the elaborate processes of modern milling, or to exclude dust from the various operations; the colours given in the accompanying table must therefore be accepted with a certain amount of caution. Each series of flour as it was tested, however, was compared with a good commercial sample of baker's flour. In three cases no description of colour is given; these were the first three wheats to be milled this year, and the mill was still contaminated to a certain degree with dust. The figures giving the percentage of ash show that the greater number of the samples were reasonably free in this respect. Certain samples are described as white when they gave a dead-white colour by the Pekar test; others are described as good, medium, &c., a light-cream colour being considered the best. The colour of the crude gluten is not given in the table, but there was found to be a very close relationship between the colour of the flour and the colour of the gluten.

The water-absorption figure gives an indication as to the amount of bread which may be made from a given weight of flour. The higher this figure, the greater will be the number of loaves made from each sack of flour. It is also a fact that a flour which absorbs more water when being made into a dough generally produces a loaf larger in volume, more palatable, better in appearance, and more nutritious.

The ratio of wet to dry gluten gives a good indication of the probable behaviour of the flour in the bakehouse. Where the ratio of wet to dry gluten ranges from 2·9 to 1 to 3·1 to 1 the quality of the gluten may be considered good, and the dough will give a good expansion in the oven. Where the ratio is greater than 3·1 to 1 the gluten becomes weak and will not stand much fermentation. Where it is less than 2.9 to 1 the gluten becomes tough and needs strong fermentation to develop a satisfactory loaf. An estimation of the quality of the crude gluten as determined by its colour, cohesiveness, adhesiveness, and elasticity is also included. There is in general a close correlation between the quantity of gluten, its quality, and the strength of the flour as determined from the volume of the loaf baked from it. In the table the samples are arranged in varieties and in order of their strength or probable capability to produce large loaves of good texture. For further information on the baking-qualities of New Zealand flours the reader may refer to articles in the *Journal* for July, August, and September, 1923.

NOTES ON THE TABULATED RESULTS.

Considering now the quality of these wheats, it is found that the samples of Velvet again maintain a very good average. The quality of the gluten is in general good, and samples R 1189 and 1200 contain excellent amounts; they are good, strong samples of this variety; R 537 and 1201 may be considered medium strong. With the exception of R 537, these samples do not show the same good capacity for water that has previously been noted, but most samples examined this year have proved lower in this respect than those reported on in 1923.

Of the samples milled as Tuscan, the first, R 745, is a good strong wheat; this sample gave only 67·1 per cent. of flour, which is low, but otherwise it appears to be a good all-round wheat. The remaining samples range from medium to rather poor in quality; in general they appear to give flour of good colour.

Two of the White-straw Tuscans, R 726 and 1193, are good all-round wheats, milling respectively the very good amounts of 74·5 and 75·7 per cent. of flour of good colour and good strength. R 726 is an improved White-straw Tuscan grown from seed obtained from Lincoln College; it contains the large amount of 15·05 per cent. gluten of good quality. The sample grown at Ashburton, R 1193, is nearly as good.

The average of the Solid-straw Tuscans is good, notwithstanding the inclusion of three weathered samples in this series. R 825, though weathered, is a good strong wheat, possessing a very good amount of gluten of fairly good quality. The colour of the flour from these weathered samples, R 824, 825, and 826, was unsatisfactory, though otherwise they are quite fair. R 1205, 535, and 826 may be considered to be medium-strong wheats, R 535 possessing a good capacity for water. The remaining two samples are wheats of medium quality.

Two samples of Victor milled well, R 1209 giving the very high yield of 77·1 per cent. flour. As is usually the case with this variety, however, the amount and quality of its gluten were poor. The colour of the flour was in each case a dead white. The three samples of

Table II.—Tests for Quality of Flours from New-Zealand-grown Wheats (Second Series).

Laboratory No.	Variety.	Locality.	County.	Year harvested.	Calculated Weight per Bushel.	Flour.	Moisture.	Absorption of Water.	Gluten, Wet.	Gluten, Dry.	Ratio of Wet to Dry Gluten.	Protein ($N \times 6{\cdot}25$).	Ash.	Colour of Experimental Flour.	Quality of Gluten, &c.
					lb.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.		Per Cent.	Per Cent.		
R 1189	Velvet ..	Ashburton ..	Ashburton ..	1924	62	72·9	13·41	51·6	46·40	14·72	3·15 : 1	14·00	0·39	Medium ..	Fairly good.
1200	,, ..	,, ..	,, ..	1924	64½	73·1	13·46	47·2	46·12	14·04	3·28 : 1	14·44	0·53	Good ..	Good.
537	,, ..	Pukeuri ..	Waitaki ..	1923	63	72·5	13·44	54·4	33·72	11·83	2·85 : 1	11·31	0·56	Medium ..	,,
1201	,, ..	Lincoln ..	Springs ..	1924	66	71·7	13·72	47·8	36·63	11·50	3·19 : 1	11·63	0·62	,, ..	,,
539	,, ..	Fairlie ..	Mackenzie ..	1923	63	70·0	13·50	53·2	27·29	9·80	2·78 : 1	9·44	0·57	Good ..	Rather poor.
R 1210	College Hunters	Lincoln ..	Springs ..	1924	66	70·6	13·74	51·6	25·52	8·72	2·93 : 1	8·31	0·63	,, ..	Good.
538	,,	Rangitata ..	Geraldine ..	1923	64	74·4	13·43	49·8	35·08	11·67	3·01 : 1	11·00	0·64	Fair ..	,,
R 745	Tuscan ..	Lake Hayes ..	Lake ..	1923	64½	67·1	13·18	49·6	42·23	13·90	3·04 : 1	10·50	0·57	Poor ..	Rather poor.
744	,, ..	Pembroke ..	,, ..	1923	65	71·9	13·26	49·0	30·14	10·21	2·95 : 1	10·50	0·62	Fair ..	Good.
747	,, ..	Crown Terrace	,, ..	1923	65½	68·0	13·53	50·4	27·71	9·17	3·02 : 1	9·54	0·50	Good ..	,,
542	,, ..	Waitawa ..	Levels ..	1923	62	70·5	13·23	50·8	23·27	8·70	2·68 : 1	9·63	0·61	,, ..	Poor.
748	,, ..	Arrowtown ..	Lake ..	1923	65½	70·2	13·04	49·6	21·06	7·31	2·88 : 1	8·06	0·53	,, ..	Rather poor.
R 726	White-straw Tuscan	Seddon ..	Awatere ..	1923	64½	74·5	13·49	51·2	44·67	15·05	2·97 : 1	13·75	0·64	,, ..	Good.
1193	Ditto ..	Ashburton ..	Ashburton ..	1924	65½	75·7	13·28	49·0	43·39	13·75	3·16 : 1	13·06	0·56	,, ..	,,
727	,, ..	Seddon ..	Awatere ..	1923	62	72·4	13·74	50·4	19·37	6·57	2·95 : 1	7·41	0·55	White ..	Poor.
R 825	Solid-straw Tuscan	Cust ..	Rangiora ..	1923	63	70·1	13·57	49·8	36·12	12·56	2·88 : 1	12·69	0·58	Poor ..	Fairly good; weathered sample.
1208	Ditto ..	Rakaia ..	Ashburton ..	1924	63½	72·4	13·42	49·2	35·85	12·37	2·90 : 1	11·38	0·57	Very good	Good.
535	,, ..	Glenavy ..	Waimate ..	1923	61	69·2	12·54	53·8	30·76	11·34	2·71 : 1	10·88	0·64	..	Fairly good.
826	,, ..	Hawkins ..	Malvern ..	1923	59	64·6	13·66	49·6	30·76	10·80	2·85 : 1	10·31	0·45	Poor ..	Good; weathered sample.
824	,, ..	Cust ..	Rangiora ..	1923	62½	69·3	13·23	50·6	29·19	10·33	2·84 : 1	10·56	0·60	,, ..	Fairly good.
1203	,, ..	Rakaia ..	Ashburton ..	1924	65	72·1	13·68	46·8	29·94	9·81	3·05 : 1	10·91	0·53	Very good	Medium.
R 1209	Victor ..	Horrelville ..	Eyre ..	1924	63½	77·1	13·57	47·8	24·69	8·23	3·00 : 1	8·50	0·57	White ..	Rather poor.
543	,, ..	Temuka ..	Geraldine ..	1923	62½	73·0	13·90	49·0	22·13	8·07	2·74 : 1	8·56	0·56	,, ..	Poor.
R 1205	Yeoman ..	Irwell ..	Ellesmere ..	1924	65½	71·3	13·48	50·4	33·16	10·78	3·08 : 1	10·25	0·56	Good ..	Good.
S 16	,, ..	Marton ..	Rangitikei ..	1924	65	73·0	13·81	51·0	31·04	9·78	3·17 : 1	9·63	0·56	,, ..	,,
R 1204	,, ..	Lincoln ..	Springs ..	1924	64	72·0	13·76	51·6	24·07	8·14	2·96 : 1	7·94	0·66	White ..	Medium.

R 536	Dreadnought ..	Weston ..	Waitaki ..	1923	63	72·5	1 : 1·5	54·6	54·47	12·15	3·84 : 1	11·99	0·63	..	Good.
541	,, ..	Studholme ..	Waimate ..	1923	65½	72·9	1 : 1·96	50·8	9·58	10·15	3·80 : 1	10·46	0·61	Medium ..	Fairly good.
R 1195	Major ..	Ashburton ..	Ashburton ..	1924	64½	74·1	1 : 1·35	48·6	7·75	11·79	4·00 : 1	11·30	0·54	Good ..	Good.
S 17	,, ..	Marton ..	Rangitikei ..	1924	65	74·4	1 : 1·09	50·0	7·49	8·59	3·08 : 1	8·56	0·60	.. ..	Poor.
								Miscellaneous.							
R 1198	Essex Conqueror	Ashburton ..	Ashburton ..	1924	62	68·2	1 : 1·52	46·8	15·74	13·91	3·90 : 1	13·14	0·49	Medium ..	Fairly good.
1192	Marquis ..	,, ..	,, ..	1924	66½	73·7	1 : 1·06	50·2	11·79	13·53	3·99 : 1	13·50	0·59	,, ..	Good.
1197	Jumbuck ..	,, ..	,, ..	1924	66	71·2	1 : 1·30	51·2	8·00	13·51	3·81 : 1	13·46	0·51	Good ..	,,
1196	Red Fife ..	,, ..	,, ..	1924	66	71·9	1 : 1·35	48·8	6·95	12·87	3·87 : 1	12·50	0·51	Poor ..	,,
540	Red Straw ..	Fairlie ..	Mackenzie ..	1923	63	72·1	1 : 1·94	55·0	8·45	12·72	2·68 : 1	11·19	0·62	,, ..	Fairly good.
1194	Queen Fan ..	Ashburton ..	Ashburton ..	1924	66½	72·7	1 : 1·33	50·8	11·06	12·57	3·28 : 1	12·09	0·50	Good ..	,,
1199	Zealand ..	,, ..	,, ..	1924	67	73·5	1 : 1·85	48·8	8·32	12·29	3·87 : 1	11·50	0·52	,, ..	Good.
1190	Queen Fair ..	,, ..	,, ..	1924	65	76·8	1 : 1·08	50·2	8·62	12·14	3·99 : 1	11·75	0·55	,, ..	Fairly good.
1207	Hybrid W. ..	Horrelville ..	Eyre ..	1924	62	75·6	1 : 1·37	49·4	9·41	12·02	3·91 : 1	11·11	0·60	,, ..	Good.
737	Burbank's Super	Omihi ..	Rangiora ..	1923	64½	70·0	1 : 1·40	55·8	8·45	11·95	2·97 : 1	11·63	0·67	Poor ..	,,
1191	Turretfield ..	Ashburton ..	Ashburton ..	1924	63	75·3	1 : 1·01	47·6	8·51	11·32	3·05 : 1	11·56	0·56	Good ..	,,
	Eclipse														
1206	Snowdrop ..	,, ..	,, ..	1924	62½	71·4	1 : 1·69	47·6	9·09	9·17	3·07 : 1	9·54	0·52	White ..	Medium.
1202	Bordier ..	Lincoln ..	Springs ..	1924	65	74·0	1 : 1·96	48·0	8·37	8·29	2·91 : 1	9·25	0·53	.. ..	Poor.

Yeoman did not appear to be better in quality than the average wheat grown in the Dominion; but samples grown in different seasons and in different environments are required in order to ascertain the suitability of new varieties, such as Yeoman, to local conditions.

Dreadnought again gave good results. The two samples tested were both medium-strong wheats, one possessing a very good capacity for water. Two samples of Major milled well, giving 74·1 and 74·4 per cent. of flour of good colour. The sample from Ashburton may be regarded as a medium-strong wheat.

The miscellaneous samples are remarkable for their average very good strength. Most of these were grown at the Ashburton Experimental Farm, and contain an amount of gluten much above the average. Whether this is due to the varieties themselves or the growing season experienced in the summer of 1923–24, or whether it is owing to the environment in which these wheats were grown, only the testing of further samples from future harvests will show. The following contained very good amounts of gluten of good quality, and are good, strong samples: Essex Conqueror, Marquis, Jumbuck, Red Fife, Red Straw, and Queen Fan. Five samples are medium-strong wheats: Zealand, Queen Fair, Hybrid W., Burbank's Super, and Turretfield Eclipse.

The miscellaneous samples of good strength give average amounts of flour. The best, Essex Conqueror, is not generally regarded as a particularly strong wheat, but it is worthy of note that of some nineteen samples received from Ashburton three years

ago Essex Conqueror was again the best in this respect. Marquis, it may be noted, is the famous variety of Canada and the United States. Jumbuck is a Farrer cross. Red Fife is a strong wheat, at one time grown extensively in Canada; it is considered to be of good quality for breadmaking. This variety has been used largely in cross-breeding experiments. Marquis is said to be a cross between an Indian wheat and Red Fife, and Yeoman is another wheat with Red Fife as one of its immediate ancestors. Queen Fan, another Australian cross, is considered in New South Wales to be a good wheat from the point of view of yield and the quality of the flour obtained from it. It may be adapted locally to areas of low average rainfall.

VARIETIES AND LOCALITIES.

In most cases only a few samples were received from each county. Where sufficient data are available from this and previous years' tests comparisons have been made.

From Ashburton County fifteen samples were received. Most of these are varieties not grown there on any extensive scale, but they maintain the remarkably good average of 13 per cent. gluten. None, however, is better in this respect than the two samples of Velvet grown in the same county, which contain the very good percentages of 14·72 and 14·04 of gluten. A sample of White-straw Tuscan, R 1193, from Ashburton, also compares favourably with these miscellaneous varieties.

Of four samples received from Springs County, the best two were College Hunters and Velvet, both good, medium-strong wheats. The strongest wheat from Waitaki County was a sample of Dreadnought, R 536; in 1923 this variety was also the best tested from that district.

Samples from Lake County show a higher average strength than those tested previously. One very good sample of Tuscan, R 745, grown at Lake Hayes, contained 13·90 per cent. gluten. A sample of selected White-straw Tuscan grown at Seddon, Awatere County, contained the large amount of 15·05 per cent. gluten, and is a wheat of excellent quality.

SUMMARY.

There is no correlation among these samples between gluten content and calculated weight per bushel.

The colour of the crude gluten shows in general a very close relationship to the colour of the flour as obtained in the experimental mill.

Velvet retains its position as a wheat of good strength. The quality of the various Tuscans shows considerable improvement, and when a few poorer and extreme samples are disregarded the average is very good. Victor again proves to be a wheat giving very good yields of flour, but of inferior strength. Dreadnought is still a good medium-strong wheat. One sample of Major was a good wheat; the other was poorer in quality.

The miscellaneous samples show a very high average of gluten content. Most of these came from Ashburton County; their general

good quality may have been due to the nature of the growing season of 1923–24.

Even when the good quality of the wheats grown at Ashburton Experimental Farm is not taken into consideration, the average strength of the samples tested during 1924 is higher than that of the varieties tested last year.

Corrections.—In the table on pages 402 and 403 of the *Journal* for June last the calculated weights per bushel contain several obvious typographical errors. Wherever the third figure in that column is a "2," this should read "½." For instance, in the first sample, R 1200 (Velvet), the weight per bushel should be 64½ lb. The variety appearing in the same table among the miscellaneous samples as "Comeback" should have been "Jumbuck," as given in the present article.

PUWERA EXPERIMENTAL AREA.

NOTES ON OPERATIONS, SEASON 1923–24.

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THOSE interested in the earlier work at Puwera should consult the previous issues of the *Journal*, which give details of cultivation and other preliminary treatment of the clay gum-lands referred to in this article. In the December, 1922, issue a sketch-plan of the experimental area was included, and references are made in the present article to the numbered fields in that plan. The work has been pursued with the main objects of (1) securing the most suitable grass-pasture, and (2) growing crops and conserving fodder for the lean periods when the production from the pasture is inadequate.

PASTURES.

The Lower-lying Areas.

Field 3a.—This area of 4 acres was sown to a permanent-pasture mixture in April, 1923. The sowing of 36½ lb. of seed included rye-grass, cocksfoot, crested dogstail, paspalum, and clovers. The very wet winter which followed the sowing on this field, which is mostly flat and low-lying, had a bad effect on the take. In spite of this, and the several dry, hot spells last summer (November and December), the pasture is now promising well. It consists mainly of rye-grasses, crested dogstail, and clovers. Young cocksfoot-plants are well distributed. The cocksfoot and crested dogstail are growing strongly, except in the case of the former on a small area above the flat. The pasture was top-dressed on 30th May last with superphosphate at the rate of 3 cwt. per acre.

Field 3b.—This section, 10 acres in extent, is in its fourth year, having been sown to grass in the autumn of 1921. The seed-mixture contained 16 lb. Poverty Bay rye-grass and 4 lb. Italian rye-grass, the rest being made up of 5 lb. of paspalum, Waipu brown-top, and clovers: total, 34 lb. per acre. The pasture has been heavily stocked with dairy cows, store steers, and wethers. The field had been top-dressed with basic slag each year at the rate of 2½ cwt. per acre. This

FIG. 1. MAP OF NORTH AUCKLAND, SHOWING THE GUM-LANDS.

The gum-land areas are shaded. Puwera is eight miles from Whangarei.

year 3 cwt. of a mixture made up of equal weights of basic slag and superphosphate was applied on 31st May and 2nd June. Hay and roots have been fed out periodically over the higher portions on the field, where the soil is poorer, and the chain and tripod harrows used regularly to distribute the dung and stir the surface.

The mixture would have been improved by the inclusion of 3 lb. to 4 lb. of crested dogstail, added at the time of sowing down, the pastures on the other fields bearing out this contention. Paspalum-plants are well distributed through the sward on the flat and in odd wet places, but very few plants are seen on the higher parts. In spite of this and the omission of crested dogstail, the pasture is remarkably good, and certainly beyond the most sanguine expectations of a few years ago. The rye-grasses and clovers — including red, white, and suckling — predominate, with Lotus major well in evidence; brown-top makes up the remainder. With the exception of a little weed-growth—chiefly cudweed, catsear, rib-grass, and field-daisy—found only on odd weak patches, the field is a close strong-growing sward of good grass. Its long period of growth throughout the year is noticeable. The grasses come away rapidly after it is spelled for a couple of weeks, even during the winter.

With the information we now have, this section of Puwera should carry grasses in the mixtures demanding higher fertility than, say, brown-top. The inclusion of cocksfoot and crested dogstail and the leaving-out of paspalum would have combined to produce what is considered farther South to be a better pasture than is found at present. This contention, as regards cocksfoot and crested dogstail, is being put to the test on the adjoining Field 3A. So far the indications are promising. Having regard to North Auckland —mainly its climatic conditions —it may reasonably be claimed that a pasture with paspalum dominant, and a spring growth produced and maintained by top-dressing with phosphatic manures, by chain harrowing, and by careful stocking, would be a better pasture. Certainly in dry summers and autumns it would provide more feed.

The Hill Paddocks.

Field 6.—The section is approximately 10½ acres in area. It is one of the hill paddocks, sloping from the highest ridge on the area down to the main Whangarei-Maungakaramea Road. The soil was first broken up about thirteen years ago, and sown to grass. The grass had run out when the field was rebroken and grassed again in April, 1921. The second sowing of 34 lb. to the acre consisted mainly of Western Wolths rye-grass, paspalum, and clovers. The pasture has been top-dressed each year. The sward, now in its fourth year, is chiefly paspalum, Lotus major, Lotus hispidus ("angustissimus"), suckling-clover or trefoil, and a little chicory and yarrow. It has produced satisfactory feed, and has been grazed since July, 1921. The paspalum is getting stronger and more widespread. With the clovers maintained by top-dressing, and the pasture improved by chain-harrowing and judicious stocking, this field is now becoming a paspalum-clover pasture, giving feed of clovers, Lotus hispidus, and Lotus major in the spring and early summer. From about November paspalum comes away and carries on until the winter. The sward is improving under the treatment outlined.

An area of about 3 acres fenced off on the upper portion of Field 6 was top-dressed on 31st May, 1923, with superphosphate at the rate of 3 cwt. per acre. It was cut for meadow hay in December; the estimated total yield was 5 tons, the hay consisting of paspalum, Lotus hispidus, Lotus major, and a little Western Wolth and Yorkshire fog.

In parts the grasses of the first sowing are showing up, in some places strongly. Chewings fescue and Danthonia are the principal offenders. It is interesting to note that a small percentage of manuka seedlings appeared on the second sowing of grass, but they have now disappeared. No manuka was noticed on the run-out pasture; it is probable that the re-turning of the sod brought buried seed to the surface again.

Field 5.—This area of 12 acres has soil of about the same quality as Field 6; it also lies similarly, but was sown to grass a year earlier. It was set out in eight plots, each 1½ acres in area. The plots run parallel to the main road, which is the lower boundary. From careful observations made periodically on the individual plots sown with different seed-mixtures much useful information has been gained of the behaviour of the various pasture-constituents. Poverty Bay

FIG. 2. A GENERAL VIEW AT PUWERA EXPERIMENTAL AREA.

Looking from Field 4 (unimproved gum-land heath) into Field 5 (pasture plots). On the lower ground in the middle distance are seen various cultivated fields and the nursery, also the Whangarei–Maungakaramea Road. The low hills beyond are typical unimproved gum-lands.

rye-grass has done best of the perennial strains. Cocksfoot, after more than four years' growth, has not done so well, even where the experimental sowings ranged from 13 lb. to 20 lb. per acre. Crested dogstail and Poa pratensis are both good. Paspalum has grown well, though it established slowly, except in the wet places, where it showed up in the first season and has since continued to get stronger. Lotus major has associated itself with the paspalum in the wet places, as one would naturally expect. White clover has done well throughout. Waipu brown-top and Danthonia pilosa have obviously both found conditions suitable. A useful volunteer among the paspalum is subterranean clover, which has come in apparently from the road-side adjoining, where it is growing in patches. It was not sown on this field, unless the seed happened to have been an impurity in the mixture. Including the dressing of fertilizer with the seed at the time of sowing, this field has received 9 cwt. per acre of phosphatic fertilizer in four years. The annual dressing, therefore, works out at $2\frac{1}{4}$ cwt. per acre. The plot on the ridge was sown with the following mixture: Poverty Bay rye-grass, 16 lb.; Danthonia pilosa, 6 lb.; paspalum, 6 lb.; white clover, 3 lb.; alsike, 2 lb.; Serradella, 2 lb.: total, 35 lb. per acre. The sward, now in its fifth year, contains a good deal of rye-grass and danthonia, with paspalum sprinkled through it. White clover is prominent, and, though hardly to be expected because of the quality of the soil, alsike is still seen. Sheep's burnet, sown only on one plot, did well for a couple of years, but has apparently disappeared.

Pioneer Surface-sowings.

Fields 4 and 7.—Field 4 is on the same face as Fields 5 and 6, but the slope is steeper. The surface is more uneven, being broken by a depression down which the surface water flows after heavy rains. Wet patches at intervals, growing rushes and water-grass (*Juncus bufonius*), along this irregular depression indicate surface springs. These springs provide convenient supplies of drinking-water for stock.

Early in February, 1922, an area of 1¼ acres near the ridge was tackled, the stunted manuka being cut and subsequently burnt late in March. The area was then disked and cross-disked, which made the rough surfaces more even. In April ½ acre was surface-sown with Danthonia, 3 lb.; paspalum, 4 lb.; Chewings fescue, 1 lb.; crested dogstail, ½ lb.; Waipu brown-top, ½ lb.; white clover, 1 lb.; Lotus major (colonial), ½ lb.: equivalent to a total of 21 lb. per acre. A fertilizer mixture of equal quantities of super and slag, at 2 cwt. per acre, was broadcast. The remaining ¾ acre was sown about a month later with the following mixture: Paspalum, 6 lb.; Danthonia pilosa, 3 lb.; perennial rye-grass, 3 lb.; Waipu brown-top, 2 lb.; Chewings fescue, 1 lb.; Poa pratensis, 1 lb.; white clover, 1 lb.; Lotus hispidus, 2 lb.; Lotus major, 1 lb.; yarrow, 2 oz.: equivalent to a total of nearly 27 lb. per acre. 2 cwt. of basic super was broadcasted before seeding.

The take, judged in the following spring and summer, was much better on the first sowing than on the second, though the seeding was lighter in the former. When the areas were inspected during the second season the one sown last had improved, but a good deal of Danthonia semiannularis had appeared. This grass is found in the adjoining unimproved gum-land, and was on both areas before the surface growth was burnt. Both areas were top-dressed on 29th June, 1923, with a mixture of equal weights of slag and super at the rate of 1 cwt. per acre. Young manuka has come up fairly freely on the surface-sowings, but the mower disposes of this growth. The pasture has been grazed for two seasons, and at present is very satisfactory.

This is a cheap method of getting a sole of grass as an initial step. The cost of the treatment on the first area sown, including clearing, burning, disking, seed, fertilizer, and sowing, works out at about £2 15s. per acre. The seed-mixture could be reduced in cost and a satisfactory covering of grass still be secured. Paspalum could be introduced into the sward by feeding out paspalum hay, or shifting stock grazing paspalum in the summer to the surface-sown pasture.

Kikuyu-grass.

The 1-acre plot in Field 2 laid down during the spring of 1922 in kikuyu, with cow-grass, white clover, and Lotus major, has given very striking results. After grazing the area until last spring it was shut up for hay. The cow-grass kept pace in growth with the kikuyu as far as height was concerned. Forced up by the kikuyu, the cow-grass was evenly distributed throughout the sward, and could be easily discerned just before cutting for hay in December, even from the main road, especially by the profusion of seed-heads. Lotus major also grew well. Cow-grass, Lotus major, and Lotus hispidus combine well with kikuyu,

and produce good hay or pasture for grazing. The aftermath was grazed. The winter growth has been better than was anticipated, in spite of cold wet weather, with several frosts in July. Up to the present kikuyu has given more winter feed than paspalum. The close sward of kikuyu excludes weeds. An outstanding feature to which attention may be drawn is that when kikuyu was grown with clovers it produced a large bulk of good forage palatable to all classes of stock, which continued to grow over a long season.

Top-dressing and Chain-harrowing.

The main fertilizer used on the Puwera pastures is basic slag, which gives very satisfactory results. Super mixed with slag or with ground rock phosphate is good, and super used with lime or applied on land previously limed also gives good results. The grass laid down with raw rock phosphate and lime, and top-dressed each year with that mixture, is still poor in comparison with adjacent plots on which rock phosphate alone was applied. Where one light dressing of super was applied across the plots dressed with rock phosphate alone, and rock phosphate and lime, the beneficial results were striking to the eye.

From top-dressing trials on permanent pasture, now in progress, first-year results showed an increase in the yield of hay of 30 per cent. (over no manure) on the plots on which rock phosphate at 3 cwt. per acre was used. From last year's results (second season) the increased yield of hay was a little over 56 per cent., but where a mixture of equal weights of super and rock phosphate was applied at the same acre-rate the increase over no manure was 93 per cent. Compared with the phosphate alone the increase was therefore 37 per cent. These results can be viewed as tentative only.

The subdivision of the area into fields not larger than 12 acres allows of the better handling of stock, so that the pastures are grazed most effectively. When spelled for a week or so the fields are run over with the tripod-chain harrows. The old contention that dung contains "something" which artificials do not may help to account for the progressive improvement of the pastures observed at Puwera. Their carrying-capacity bears this out, and the quality of the pasture may be judged by the rapidity with which stock fatten.

SUPPLEMENTARY FORAGE CROPS.

Mangolds failed in the season under review; it is suspected that the seedlings were eaten by cutworms. John Bull and Superlative swedes and Hardy Green Globe turnips were grown and fed to the cattle along with meadow hay during the winter. Crops of green maize, sorghum, and millet proved useful in the autumn and winter. Sorghum saccharatum was the variety grown, and it produced an excellent crop. Cattle-pumpkins and marrows were grown among the maize, and did well. Oaten sheaf produced in Field 7 was fed to the horses. The sheep received only millet in addition to the grazing on the pastures. Altogether $6\frac{1}{2}$ acres were devoted to crops. Areas of $3\frac{1}{2}$ acres were cut for hay—1 acre of which was kikuyu-grass already referred to.

Incidentally it may be mentioned that pukeko have proved troublesome at Puwera for a number of years. The birds pull up maize, millet, and other seedlings, also red-clover plants.

NURSERY NOTES.

Millet grown with crimson clover produced a useful crop. Crimson clover has consistently done well at Puwera. Durango Upland cotton promised very well; the plants flowered, and the bolls formed and grew well, but bad storms in April and May prevented the crop ripening off. Kudzu grew well, but went off when the winter set in. White-fleshed swedes again gave a good crop, resisting the dry spells and showing no disease.

FIG. 3. A FARMERS' FIELD-DAY DEMONSTRATION AT PUWERA.

LIVE-STOCK.

The pastures and crops grown on the area have carried dry stock continuously and dairy cows for short periods. The carrying-capacity of the improved part of the area works out at the equivalent of a cattle beast to slightly over 2 acres. Store steers, three years and upwards, have become prime in on an average of from ten to fourteen months. Though trouble was experienced with sheep a few years ago, the last lot did well. The pastures are now fit to carry dairy stock profitably.

Noxious Weeds Orders.—Hemlock has been declared a noxious weed in Lower Hutt Borough, and gorse and Bathurst burr in the Russell Town District. Wallace County has declared Californian thistle and ragwort *not* to be noxious weeds.

Sheepowners in the Dominion.—Owners of sheep as at 30th April last totalled 23,423, classified as follows: 100 to 200 sheep, 5,919 owners; 210 to 500, 6,008 owners; 501 to 1,000, 5,071 owners; 1,001 to 2,500, 4,393 owners; 2,501 to 5,000, 1,356 owners; 5,001 to 7,500, 370 owners; 7,501 to 10,000, 152 owners; 10,001 to 20,000, 128 owners; 20,001 and over, 26 owners.

WINTON EXPERIMENTAL AREA.

NOTES ON WORK IN 1923-24 SEASON.

R. McGILLIVRAY, F.L.S., Fields Division, Invercargill.

THE Winton Experimental Area now comprises a block of nearly 100 acres. The soil, consisting mostly of medium to heavy loam, is on the whole eminently suited for the purpose for which it is used. On the block recently added some drainage operations are required before full use can be made of the land; the remainder of the area is now in a satisfactory condition in this respect. Considerable interest has been shown during the past year in the working of the area, and visitors from as far north as Temuka have called and had the scheme of experiments explained to them. The majority of visitors seemed to be specially interested in the pasture blocks and grazing results; the fodder-crop and wheat areas also came in for much attention. Following is a general summary of the work carried out and the results obtained for the year.

PASTURE INVESTIGATION.

Pure Sowings (Sections 1 and 2, 10 Acres).—This block was laid down in 1920 in pure sowings of the following grasses: Meadow-foxtail, meadow-fescue, timothy, crested dogstail, Poa pratensis, Poa trivialis, red-top (fiorin), Yorkshire fog, perennial rye-grass, and cocksfoot (New Zealand and Danish). The object was to ascertain the palatability, duration, and production of the respective grasses under ordinary field conditions. During the past year, in order to ascertain the relative palatability of the various grasses, observations were made as to which varieties were most closely grazed, and regarding the distribution of sheep while grazing on the whole block. Timothy was the grass that stood out above all others in this respect, while Poa trivialis, meadow-foxtail, crested dogstail, and perennial rye-grass appeared to be next in preference in the order named. The whole flock were at times to be seen grazing on the timothy, Poa trivialis, and meadow-foxtail plots, with the timothy area generally receiving more attention than the other two, and the remainder of the block more or less neglected.

As regards cocksfoot, the area sown with New Zealand seed had a much closer sward than the Danish, although both were sown at the rate of 20 lb. per acre. There actually appeared to be as many plants per square yard in the Danish area, but the amount of leafage was less. This characteristic was most noticeable during the dry weather of last autumn. The New Zealand strain at that time showed a much better growth, with very little bare ground between the plants. There did not appear to be any difference between New Zealand and Danish in so far as palatability was concerned.

The varieties that showed the least growth were red-top and Poa pratensis, and Yorkshire fog and meadow-fescue decreased in vitality to a marked extent during the year.

Short-rotation Pasture (Section 3, 5 Acres).—This section is doing well. The seeding was 40 lb. perennial rye-grass, 6 lb. Italian rye-grass, 2 lb.

white clover, and 3 lb. red clover. The pasture has stood heavy stocking well and is still in good heart, and with top-dressing should last in a remunerative condition for a further period of several years. This is a type of pasture much in demand by sheep-farmers at certain seasons of the year. The cost of the mixture is comparatively small, and a profitable return is secured in the first season.

Permanent Pasture (Section 4, 5 Acres).—This block was sown in 1920. There have been many inquiries for the mixture used, so that it will be of interest to again record particulars as follows: Cocksfoot, 14 lb.; perennial rye-grass, 7 lb.; meadow-fescue, 7 lb.; meadow-foxtail, 4 lb.; Poa trivialis, 3 lb.; crested dogstail, 3 lb.; timothy, 3 lb.; red clover, 4 lb.; white clover, 2 lb.; Lotus major, 1 lb. The most prominent of these grasses at present is crested dogstail, with cocksfoot second, and timothy third in order. The white clover has established well, and is in first-class condition. The pasture is an exceptionally fine one. The carrying-capacity from September until the end of March, 1923–24, was eight sheep per acre, and for the whole year it works out at 5·14 sheep per acre. During some periods the rate of stocking was very heavy. For instance, from 20th to 27th October, both dates inclusive, it carried twenty-four ewes and their lambs per acre, and for three days in December it was stocked at the rate of eighty-nine sheep per acre. Many farmers have been so impressed with the amount of feed yielded and the satisfactory condition of this pasture that they have sown a similar mixture. As indicated, this pasture is now in its fourth year, and competent judges who have been in touch with it since its establishment are of opinion that it is improving each year.

Temporary Pasture (Section 5, 5 Acres).—The mixture used for this pasture consisted of 35 lb. Italian rye-grass and 4 lb. red clover, and was sown on 18th October, 1923. Dry weather was experienced from the start, but the pasture gave considerable feeding until severely attacked by grass-grub last autumn. The section is to be surface-sown with Italian rye-grass to provide plants to take the place of those destroyed by the grub.

Rate of Seeding of Rye-grass (Section 6, 5 Acres).—This is a most interesting block, and has had many visitors. It was laid down with the object of settling the conflict of opinion as to the quantity of perennial rye-grass to include in pasture mixtures in Southland. The field is divided into five 1-acre areas, sown respectively with 10 lb., 20 lb., 30 lb., 40 lb., and 50 lb. of rye-grass per acre. It is quite evident that 10 lb. is too little and 50 lb. far too much. The 20 lb. area is quite good; but, taking everything into consideration, the 30 lb. area is the best of all, and would indicate that from 25 lb. to 30 lb. of perennial rye-grass is about the correct quantity to include in a general mixture in this district.

SUMMER AND WINTER FORAGE CROPS (SECTION 7, 5 ACRES).

These crops consisted of Drumhead cabbage, chou moellier, Buda kale, broad-leafed Essex rape, and Thousand-headed kale. The summer crops experienced dry weather almost throughout their growing-period, and thus yields were not high. Weights taken on 29th February gave yields as follows: Cabbage, 10·88 tons; chou moellier, 17·4 tons;

Buda kale, 19 tons; rape, 14·14 tons; and Thousand-headed kale, 16·86 tons, per acre. The winter crops made rapid growth towards the end of February, and the three varieties kept for the final feeding-test yielded as follows: Cabbage, 27·37 tons; Thousand-headed kale, 25·29 tons; and chou moellier, 27·8 tons, per acre. These three fodders occupied a total area of 1½ acres, and carried 118 four-tooth and six-tooth wethers for twenty-one days, which indicates that they consumed in that time 90,092 lb. of green feed. This works out at 36 lb. per wether per day; or, estimating the average dry-matter content of these forages at 11 per cent., each wether consumed about 3·9 lb. of dry matter per day.

CATCH-CROP (SECTION 8, 5 ACRES).

This section was allotted for swede and turnip tests, but owing to the low rainfall experienced these had to be abandoned. Towards the end of March an area of 3½ acres was worked and sown with 2 bushels Emerald rye-corn, 12 lb. Italian rye-grass, and 4 lb. crimson clover per acre. The resultant growth was good, and much early spring feed has resulted. This is a mixture of high merit, the rye-corn giving a large quantity of feed which is liked by sheep and available at a critical time of the year.

WHEAT TESTS (SECTION 9, 10 ACRES).

The varieties tested were Solid-straw Tuscan, Major, Velvet, and Marquis. All varieties were sown on 3rd October with 2 cwt. basic superphosphate per acre. Marquis was cut on 13th February, and Major and Tuscan on 23rd February. Velvet was very slow in maturing, and was not cut until 5th April. The yields were as follows: Solid-straw Tuscan, 40·33 bushels; Velvet, 24·56 bushels; Marquis, 22·83 bushels; and Major, 18·13 bushels, per acre. One outstanding feature in this crop was the very marked influence of lime on the soil conditions and growth of the wheat. There was an unlimed strip across each plot, and on this area, in the case of each variety, growth was thin and stunted, and the yield would not exceed 5 bushels per acre.

GENERAL.

Ten acres of the newly added land have been swamp-ploughed preparatory to an attempt being made to eradicate creeping-fog grass (*Holcus mollis*), with which this portion of the area is overrun.

Most of the grasses in the pasture blocks, despite very heavy stocking, were inclined to run to seed in January. This was prevented by running the mower over the pastures where necessary.

Mr. W. Campbell still occupies the position of Overseer of the Area, and has carried out much important work during the year.

Importation of Fruit-trees from Australia.—The embargo on the importation of pear, apple, quince, or stone-fruit trees from Australia into New Zealand, which has been in force since 1917, was removed by an Order in Council gazetted on 25th September. The disease *Bacterium tumefaciens* (hairy-root, crown-gall, or root-knot), the occurrence of which gave rise to the embargo, was by the same order deleted from the Fifteenth Schedule of the regulations under the Orchard and Garden Diseases Act.

TESTING OF PUREBRED DAIRY COWS.

JULY TO SEPTEMBER CERTIFICATE-OF-RECORD LIST.

Dairy Division.

THE appended list gives particulars for all cows which have received certificates during July, August, and September, 1924. It will be noticed that a number of good performances are recorded, but space-restrictions preclude special comment on this occasion. The only really outstanding record is that of Mr. A. Christie's Jersey champion, Vivandiere, whose performance was the subject of a special article in last month's *Journal*.

The opportunity is taken of correcting an inadvertency in connection with notes on C.O.R. cows published in the July *Journal*. It was there stated that the dam of Grafton Marigold (bred by Mr. A. A. White, of Manurewa), was Pepper's Girl. This should have been Grafton Crocus, also bred by Mr. White. Grafton Crocus is by Grafton Black Fern (Imp.) from Magnet's Pansy, who goes back to Retford Boy and Waikato's Fancy.

LIST OF RECORDS.

* Cow milked three times daily during whole lactation period. † Milked three times daily during part of period.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	JERSEYS.					
Junior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Real Lace	A. Christie, Tanekaha ..	1 292	240·5	365	8,831·4	559·51
Roslyn Double's Peace	J. Harris, Bombay ..	1 299	240·5	356	8,593·5	506·20
Rosebank Sunshine ..	B. Hey, Riverlea ..	1 321	240·5	365	7,419·0	498·13
Jersey Lea Daphne ..	S. Bowker, Ihakara ..	1 301	240·5	365	8,635·9	497·66
Ngahiwi Prim ..	W. J. Freeth, Waitara ..	1 293	240·5	346	9,015·6	492·31
Waitangi Baby ..	Truby King, Stratford ..	1 317	240·5	365	7,768·6	481·66
Wairere Sunflower ..	A. Faull, Stratford ..	1 337	240·5	365	8,688·8	475·48
Bridge View Peaceful	A. L. Hooper, Mahoe ..	1 320	240·5	365	8,162·0	472·81
Wairere Gipsy ..	A. Faull, Stratford ..	1 349	240·5	365	8,270·7	467·23
Lady Lonsdale ..	E. M. Spinley, Palmerston N.	2 91	249·6	365	8,120·9	466·22
Bridge View Foxglove	A. L. Hooper, Mahoe ..	1 338	240·5	365	7,°99·5	455·75
Bridge View Genoa Girl	A. L. Hooper, Mahoe ..	1 314	240·5	365	8,152·8	451·97
Pinewood's Lass ..	J. B. Tonar and Son, Northcote	2 73	247·8	305	7,151·2	449·23
Gowanbrae Malaprop	O. C. Sutton, Richmond ..	1 321	240·5	365	10,572·1	447·88
Atholwood Pink Lady	A. B. Robertson, Hawera ..	1 363	240·5	365	9,088·9	447·49
Lindon Grove Myrtle	M. A. Gadsby, Stratford ..	1 286	240·5	365	7,436·4	429·88
Pelynn Holly ..	L. K. Tarrant, Ngaere ..	1 361	240·5	341	7,292·3	424·15
Parakau Fairy ..	Marshall Bros., Pukeoware ..	1 303	240 5	365	8,193·7	420·73
Brentwood Tulip ..	C. A. Willis, Pukekohe ..	1 343	240·5	365	7,562·5	419·33
Pelynn Konini ..	L. K. Tarrant, Ngaere ..	1 357	240·5	344	6,653·7	416·28
Hua Brook Elva ..	A. J. Miller, Uruti ..	1 347	240·5	305	7,336·8	384·03
Bridge View Bluebelle	A. L. Hooper, Mahoe ..	1 363	240·5	318	6,274·2	380·98
Thornycroft Blackbird	S. J. Bennett, Kaupokonui ..	2 4	240·9	342	7,363·6	372·42
Briar Bank Princess Jenny	R. D. Dagg, Kaponga ..	1 313	240·5	328	6,943·3	370·80
Atholwood Dainty Step	A. B. Robertson, Hawera ..	2 38	244·3	365	7,562 5	364 27
Edgarley's Gracious ..	T. A. Millear, Tuakau ..	1 312	240·5	310	6,297·5	363·51
Elpin Grange O.K. ..	E. S. Walker, Stratford ..	2 4	240·9	299	6,382·9	352·45

LIST OF RECORDS—*continued.*

JERSEYS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
		Yrs. dys.	lb.		lb.	lb.
Junior Two-year-old—continued.						
Bridge View Lady Viola	A. L. Hooper, Mahoe ..	1 176	240·5	365	5,383·8	352·32
Thornycroft Darkie ..	S. J. Bennett, Kaupokonui ..	2 4	240·9	335	6,295·7	341·16
Kahuwera La Perle ..	J. V. Mortensen, Piopio ..	1 322	240·5	365	6,866·9	338·81
Creekton Princess Mai	C. Brock, Eltham ..	2 7	241·2	365	6,992·1	336·61
Elpin Grange Surprise	E. S. Walker, Stratford ..	2 26	243·1	275	5,279·1	331·04
Silverley's Lucy ..	Boon Bros., Poroporo ..	1 290	240·5	329	5,783·5	330·94
Hawkesbury Gold Ladyship	S. J. Goulter, Haumoana ..	1 323	240·5	365	6,848·1	324·34
Meadowvale War Sprite	E. Griffiths, Cambridge ..	2 11	241·6	341	4,888·7	322·04
Viola's Peeress ..	E. Griffiths, Cambridge ..	2 79	248·4	288	5,056·5	319·85
Sunflower's Pansy ..	R. Maddren, Winchester ..	1 261	240·5	365	5,713·3	316·88
Maori Cloudy ..	Aickin and McCarroll, Woodhill	1 321	240·5	332	6,417·8	313·24
Awaroa Queen's Beauty	G. Bright, Otaua ..	1 291	240·5	292	5,200·0	305·80
Rosedale Carnation ..	E. J. Adams, Puni ..	1 319	240·5	353	6,142·4	301·71
Springfield Nancy ..	A. G. Somervelle, Takapau ..	1 260	240·5	365	5,630·4	297·89
Heatherlea Lady Swan	H. J. Lancaster, Levin ..	2 33	243·8	322	5,499·8	294·19
Imperial Golden Lass	W. Muir, Waihi	2 35	244·0	308	4,924·8	293·06
Taumata Park Lady Melinda	W. D. Knowles, Whenuakura	1 352	240·5	291	5,178·6	292·08
Fidele of Rosy Creek	E. Griffiths, Cambridge ..	1 327	240·5	325	5,009·2	285·51
Grandeur	J. Muir, Brixton	1 244	240·5	248	5,891·4	283·16
Perfect Life ..	E. Griffiths, Cambridge ..	2 20	242·5	299	4,586·5	277·44
Springbank Dot's Bairn	E. S. Holdaway, Ballance ..	2 52	245·7	287	4,811·7	259·68
Hawkesbury Princess Rosa	J. W. Topham, Temuka ..	2 3	240·8	250	5,303·9	245·65
Pencarrow's Triangle Girl	W. E. Garry, Kumeu ..	1 343	240·5	265	4,675·7	245·29
Senior Two-year-old.						
Rosedale Fairy ..	E. J. Adams, Puni ..	2 299	270·4	365	12,259·7	610·79
Raithwaite Belle* ..	F. J. Finer, Ngutuwera ..	2 363	276·8	358	11,930·3	600·13
Waionui Princess ..	P. Doyle, Te Awamutu ..	2 280	268·5	365	8,674·9	548·49
Elmsted Girlie ..	R. C. Powell, Bunnythorpe ..	2 296	270·1	342	8,187·7	515·45
Koro Koro Princess ..	R. W. Southee, Kiwitea ..	2 223	262·8	365	9,384·1	503·09
M. C's. Charity ..	P. C. Short, Lowgarth ..	2 235	264·0	362	9,550·0	494·65
Linwood Victoria ..	W. V. Hosking, Wharehuia	2 360	276·5	350	8,828·5	492·67
Flower of the Glens ..	L. A. Lancaster (deceased), Kairanga	2 318	272·3	315	7,373·0	485·04
Meadowvale Petrova	S. J. Robinson, Hinuera ..	2 339	274·4	365	7,689·4	476·22
Ianthia	F. J. B. Ryburn, Paterangi ..	2 255	266·0	365	7,456·2	439·70
Llangollen Primrose ..	J. T. Entwisle, Cambridge ..	2 341	274·6	365	7,400·7	438·57
Bridge View Duchess	A. L. Hooper, Mahoe ..	2 316	272·1	335	6,940·9	434·86
Featherston Lady ..	J. Davies, Maxwelltown ..	2 337	274·2	353	7,654·0	430·25
Dame Fox	J. Swindlehurst, Shannon ..	2 306	271·1	323	7,106·9	422·73
Reid Park Likeness ..	H. N. Svendson, Pukekohe	2 338	274·3	365	8,279·9	419·75
Roslyn Twin Fairy ..	J. Harris, Bombay ..	2 329	273·4	349	6,350·0	401·93
Violet Swan ..	Dr. F. J. Watson, Bull's ..	2 356	276·1	300	5,978·0	395·93
Hill View Rene ..	R. Wattam, Fencourt ..	2 183	258·8	365	7,199·8	385·66
Middlewood Maggie ..	J. H. Mungavin, Ohau ..	2 251	265·6	315	6,564·2	383·82
Hawkesbury Ladyship Pansy	S. J. Goulter, Haumoana ..	2 331	273·6	365	7,336·4	372·62
Nirvana's Fox ..	G. Bright, Otaua ..	2 227	263·2	345	6,993·3	370·84
Hawkesbury Caroline	W. E. Pilcher, Raumati ..	2 319	272·4	365	7,252·1	345·39
Erindale Lady Winsome	T. H. Broomfield, Kaponga	2 334	273·9	365	5,568·2	339·03

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert	Yield for Season.		
				Days.	Milk.	Fat.
		JERSEYS—*continued.*				
Three-year-old.		Yrs. dys.	lb.		lb.	lb.
Zenda*	F. J. Finer, Waverley ..	3 327	309·7	335	10,725·6	614·51
Jersey Lea's Faith's Patch	S. Bowker, Ihakara ..	3 323	309·3	365	11,608·4	586·65
Kahuwera's Fairy ..	J. V. Mortensen, Piopio ..	3 362	313·2	365	9,783·6	584·85
Engdale's Match ..	P. Doyle, Te Awamutu ..	3 195	296·5	365	11,682·8	580·06
Qui Vive	L. and J. Griffith, Weraroa	3 336	310·6	350	10,101·0	573·69
Oakvale Tit Bit ..	J. H. Street, Bell Block ..	3 4	277·4	365	10,020·5	540·03
Edendale Topsy ..	C. A. Care, Reynolds Settlement	3 317	308·7	359	11,246·0	528·72
Fernaig Enid ..	H. W. Le Bailly, Buckland..	3 219	298·9	365	8,284·0	513·56
Lynford's Nester ..	P. Jones, Woodville ..	3 338	310·8	365	9,435·9	508·56
Maiden's Rosebud ..	J. Klenner, Kaimata ..	3 313	308·3	365	8,895·5	508·03
Volee's Forest Lass ..	P. A. Anderson, Levin ..	3 327	309·7	361	9,232·1	505·78
Silverley's Lady ..	J. S. Jones, Bell Block ..	3 5	277·5	308	8,128·7	492·32
Peggy's Lady ..	J. H. Street, Bell Block ..	3 335	310·5	365	8,770·5	488·68
Jersey Park Bountiful	Boon Bros., Poroporo ..	3 24	279·4	321	7,893·0	483·18
Te Ngutu's Princess..	H. R. Penny, Okaiawa ..	3 363	313·3	365	9,542·0	476·13
Espanita	G. E. Cowling, Manaia ..	3 324	309·4	365	8,475·1	455·32
Anticipation ..	E. Bennett, Cardiff ..	3 363	313·3	299	7,185·7	443·42
Carranza's Daisy ..	J. Klenner, Kaimata ..	3 331	310·1	319	7,840·1	418·74
Magnum Bonum† ..	R. Clark, jun., Te Kowhai..	3 41	281·1	325	8,508·5	390·68
Meadowvale Star Queen	W. D. Knowles, Whenuakura	3 342	311·2	268	6,938·3	372·36
Riverlea's Vixen ..	Mrs. C. O'Callaghan, Tikinui	3 296	306·6	321	5,735·6	360·12
Goldie Locks ..	Mrs. A. Henderson, Hairini	3 348	311·8	340	6,023·1	355·91
Jersey Park's Baby ..	W. D. Knowles, Whenuakura	3 316	308·6	305	5,801·2	321·54
Jersey Meadows Bess	W. E. Pilcher, Raumati ..	3 45	281·5	240	5,418·0	303·01
Springbank Star ..	E. S. Holdaway, Ballance ..	3 31	280·1	251	5,867·0	294·72
Four-year-old.						
Jersey Lea Madge ..	S. Bowker, Ihakara ..	4 359	349·4	365	12,993·9	663·34
Countessa	A. J. Luxton, Omata ..	4 278	341·3	365	10,168·1	591·28
Crown Jewel ..	G. E. Cowling, Manaia ..	4 310	344·5	365	9,237·6	574·47
Crofton's Fairy ..	A. J. Luxton, Omata ..	4 331	348·6	365	10,457·2	550·93
Lyndon Flower Girl ..	S. J. Robinson, Hinuera ..	4 357	349·2	319	8,404·6	525·58
Miss Miro	J. E. Young, Otakeho ..	4 290	342·5	331	9,259·5	517·71
Alicante	J. A. Pettigrew, Pihama ..	4 343	347·8	365	9,762·0	507·06
Hawkesbury Gem ..	J. Robb, Westmere ..	4 248	338·3	333	9,751·0	470·75
Pencarrow's Chief Lady	Tokomaru Flaxmill Co., Tokomaru	4 329	346·4	315	7,965·4	465·32
Silver Primrose ..	Mrs. A. Henderson, Hairini	4 2	313·7	344	6,098·6	404·32
Yum Yum ..	J. Klenner, Kaimata ..	4 189	332·4	292	7,883·4	403·81
Falconite's Marigold..	J. Karl, Paterangi ..	4 364	349·9	365	8,071·8	394·73
Meadowvale Gold Girl	W. D. Knowles, Whenuakura	4 1	313·6	259	6,536·8	337·83
Mature.						
Vivandiere ..	A. Christie, Tanekaha ..	6 10	350·0	365	17,282·1	1036·09
Maori Nikau ..	R. Clark, jun., Te Kowhai..	6 228	350·0	365	14,741·9	709·21
Veritas	J. H. Street, Bell Block ..	5 295	350·0	365	11,571·2	687·56
Zenith's Maid ..	H. C. Sampson, Hillsborough	6 11	350·0	347	10,870·0	634·85
Camboge's Wonder ..	J. Richards, Ohangai ..	6 183	350·0	365	10,100·6	620·47
Oakden Beauty ..	S. R. Lancaster, Palmerston North	7 340	350·0	365	10,928·7	603·02
Cream K. C. ..	A. L. Hooper, Mahoe ..	6 5	350·0	365	10,662·4	598·70
Fury's Solid Gold ..	G. E. Cowling, Manaia ..	5 82	350·0	365	9,850·1	580·72
Toot Sweet ..	C. Jones, Woodville ..	5 335	350·0	365	10,742·1	570·53

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	JERSEYS—*continued.*					
Mature—continued.		Yrs. dys.	lb.		lb.	lb.
Treasure's Dot ..	J. Hale, New Plymouth ..	7 286	350·0	365	9,385·8	565·05
Merripit	J. V. Mortensen, Piopio ..	6 302	350·0	353	10,892·1	557·86
Jersey Corner Alsike..	H. J. Lancaster, Levin ..	8 6	350·0	323	10,132·1	551·67
Oakden's Gem ..	J. Robb, Westmere ..	5 267	350·0	365	9,530·2	544·83
Maiden of Jersey Meadows	H. H. Phillips, Te Rehunga	5 328	350·0	361	8,665·0	543·10
Jersey Brae's Necklace	J. T. Entwisle, Cambridge..	5 325	350·0	365	9,449·3	538·63
Gipsy Gold.. ..	J. H. Mungavin, Ohau ..	5 325	350·0	337	10,469·0	537·27
Quibble	J. J. Scheuber, Hawera ..	5 321	350·0	320	12,356·4	536·19
Maori Pearl ..	H. B. Lepper, Lepperton ..	6 63	350·0	354	9,591·9	535·89
Juanita's Girl ..	R. Maddren, Winchester ..	5 355	350·0	365	9,752·2	518·77
Paratawhiti Gossamer	G. E. Cowling, Manaia ..	7 345	350·0	365	9,333·6	517·34
Jersey Lea Bess ..	S. Bowker, Ihakara ..	5 4	350·0	350	9,441·4	507·77
Clematis of Pelynn ..	L. K. Tarrant, Ngaere ..	5 358	350·0	346	8,894·1	499·94
Optician's Prim's Rose	W. E. Pilcher, Raumati ..	7 305	350·0	355	9,373·9	493·46
Glendyfrdwy Cutey ..	S. J. Robinson, Hinuera ..	7 312	350·0	332	8,501·5	489·94
Co-operation ..	J. Muir, Brixton	6 45	350·0	242	9,118·4	489·01
Merrivale's Lass ..	S. R. Lancaster, Palmerston North	7 24	350·0	365	11,014·2	480·81
Reid Park's Queenlike	W. C. S. Hosking, Waiuku..	5 266	350·0	299	10,354·4	477·84
Rose of Rostrevor ..	J. Hunt, Richmond ..	7 349	350·0	365	8,935·2	476·88
Opal Star	Dr. H. O. Washbourn, Richmond	6 290	350·0	365	8,619·5	472·07
Peggy's Queen ..	J. Muir, Brixton	8 362	350·0	249	9,136·9	471·86
Cavell	J. Klenner, Kaimata ..	7 296	350·0	365	8,843·7	468·59
Winnie's Viola ..	D. L. A. Astbury, Mangatoki	5 77	350·0	365	6,998·0	455·10
Oakden Rosette ..	C. A. Care, Reynolds Settlement	5 362	350·0	340	8,691·0	453·24
Teresa of Willowbank	J. S. Jones, Bell Block ..	7 6	350·0	294	8,783·8	451·11
Calabria	C. Stevens, Maungatapere ..	6 32	350·0	365	8,262·5	450·32
Te Arei's Riotress ..	C. Brock, Eltham ..	10 49	350·0	365	8,919·3	449·03
Beachland's Pansy ..	O. Ross, Waihi	8 34	350·0	332	8,790·7	448·73
Lassie's Cherub ..	J. Klenner, Kaimata ..	5 358	350·0	282	9,049·1	435·17
Fox's Freda ..	E. Griffiths, Cambridge ..	6 346	350·0	300	6,851·1	430·44
Waipiko Miriam ..	E. J. Adams, Puni ..	8 301	350·0	320	8,064·4	424·61
Maori Damsel ..	A. A. White, Auckland ..	8 58	350·0	295	7,692·5	423·54
Disdain's Maid ..	H. J. Addenbrooke, Ngaere	10 12	350·0	294	7,432·2	417·11
Cidaline	E. Griffiths, Cambridge ..	5 234	350·0	336	7,501·1	391·03
Circe of Bull's ..	F. J. Watson, Bull's ..	5 88	350·0	365	8,592·2	386·64
Piakau Ladybird ..	R. E. Clements, Awakino Point	5 14	350·0	298	6,750·7	365·99
Prospero's Fairy ..	H. J. Addenbrooke, Ngaere	8 17	350·0	292	6,487·7	359·81
Saxon Girl	A. R. Clark, Hamilton ..	8 241	350·0	284	7,633·2	357·82
Zazel	J. Swindlehurst, Shannon..	6 355	350·0	280	7,010·4	350·11
	FRIESIANS.					
Junior Two-year-old.						
Rosevale Queen Sylvia Triumph*	H. North and Sons, Omimi	2 129	253·4	365	15,240·0	621·23
Ellerlea Colantha Posch*	A. C. M. Finlayson, Kamo..	1 362	240·5	365	12,330·6	406·51
Tamaki Princess Lily*	R. Marr, East Tamaki ..	2 27	243·2	247	10,242·7	389·81
Pearl Artis† ..	W. Barton, Featherston ..	2 109	251·4	365	10,441·3	362·83

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
		FRIESIANS—*continued.*				
Senior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Mountain Vale Segis Alcartra*	C. Goble, Piakau ..	2 308	271·3	365	20,176·2	676·98
Pareora Dominion Van Thumper*	A. S. Elworthy, Timaru ..	2 206	261·1	365	13,404·1	509·53
Longview Wild Rose Segis*	C. R. Duncan, Whangamarino	2 277	268·5	365	17,022·8	509·40
Mutual Nancy Keyes†	W. Barton, Featherston ..	2 297	270·2	365	11,073·1	361·15
Junior Three-year-old.						
Cloverlea Monona Warden*	E. F. Peacocke, Hamilton ..	3 148	291·8	365	12,839·1	424·99
Senior Three-year-old.						
Woodlyn Rose De Kol*	T. C. Barbour, East Tamaki	3 271	304·1	365	18,110·2	634·67
Woodlyn Colantha Mavis†	T. C. Barbour, East Tamaki	3 310	308·0	342	13,389·2	510·78
Weston Lea Snowdrop Challenge*	E. F. Peacocke, Hamilton..	3 328	309·8	365	14,399·8	450·56
Monavale Queen Pauline†	R. Marr, East Tamaki ..	3 355	312·5	231	10,252·5	390·78
Junior Four-year-old.						
Woodlyn Stella Manor*	T. C. Barbour, East Tamaki	4 147	328·2	365	19,351·5	683·03
Senior Four-year-old.						
Westmere Pietje Fobes*	R. A. Cameron, Paraparaumu	4 251	338·6	365	20,447·6	650·12
Mature.						
Longbeach Everlasting*	J. H. Grigg, Longbeach ..	5 223	350·0	356	21,631·4	759·93
Longbeach Transvaal Queen*	J. H. Grigg, Longbeach ..	7 221	350·0	352	21,488·2	706·02
Glen Iris Heather Lady*	R. R. Pearson, Rongotea ..	5 2	350·0	365	20,337·9	683·44
Glen Iris Duchess De Kol*	R. R. Pearson, Rongotea ..	6 312	350·0	364	19,301·7	638·33
Princess Manor De Kol*	T. C. Barbour, East Tamaki	6 202	350·0	365	16,632·4	602·85
Dominion Blanche Frisby	C. D. Farm, Weraroa ..	7 139	350·0	355	17,333·2	600·29
Alcartra Segis Van Racelands*	C. Goble, Piakau ..	5 355	350·0	365	15,571·9	554·35
Kokatau Queen* ..	W. H. Madill, Auckland ..	8 154	350·0	365	12,387·6	429·12
Cluny Pietje Vernon†	A. H. Russell, Hastings ..	7 4	350·0	320	11,753·2	403·84
Lady Taureau† ..	F. Crump, Springston ..	5 318	350·0	341	10,755·6	392·34
Alcartra Jewel† ..	A. H. Russell, Hastings ..	9 254	350·0	355	10,805·0	375·40
	MILKING SHORTHORNS.					
Senior Two-year-old.						
Vale Royal Sweet Pea	W. Bowis, Doyleston ..	2 348	275·3	325	7,968·75	308·77
	AYRSHIRES.					
Two-year-old.						
Rutland Stately II ..	R. Marshall, Runciman ..	2 268	267·3	365	7,252·2	292·76
Mature.						
Queen Mary* ..	E. J. Irving, Ryal Bush ..	5 347	350·0	365	14,760·0	573·65
Turvy I of Ayrshire Downs	Litchfield Bros., Tirau ..	6 364	350·0	348	10,084·7	401·19

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
AYRSHIRES—*continued.*						
Mature—continued.		Yrs. dys.	lb.		lb.	lb.
Victoria II of Edendale	W. Hall, Lepperton ..	5 317	350·0	337	11,344·4	446·33
Kilmaronock Doris ..	R. Marshall, Runciman ..	8 0	350·0	330	9,485·6	372·38
RED POLLS.						
Dominion Lady Nicotine	Central Development Farm, Weraroa	2 241	264·6	295	6,147·4	275·11

Second-class Certificates.

JERSEYS.						
Junior Two-year-old.						
Illawarra Bloom ..	W. H. Rutledge, Midhirst ..	2 33	243·8	365	7,352·0	414·59
Mountain Lily ..	G. Buchanan, Paeroa ..	1 250	240·5	365	6,700·5	323·44
Four-year-old.						
Silverstream Lady Fox	G. B. Hull, Silverstream ..	4 292	342·7	365	10,841·7	492·25

REDUCTION IN FEES FOR C.O.R. TESTING.

THE attention of breeders of purebred dairy cattle is drawn to the fact that the Minister of Agriculture has sanctioned a reduction in the fee for testing cows under the certificate-of-record system.

It is to be recognized that the actual testing fee is only a portion of the cost entailed in having a cow's yield authenticated. The necessary supplementary feed required in order that a cow may do herself justice is in itself a considerable item, and there are, of course, other incidental charges embodied in the various smaller special attentions which the cow under C.O.R. test usually receives. The Department wishes to encourage the smaller breeders more particularly. The new charge is to come into effect as from the commencement of the next financial year—namely, 1st April, 1925. For all cows calving for commencement of test after that date the fee for the first cow tested each year on any one farm will be £8 8s., instead of £10 10s., as at present. The fee for subsequent entries will remain at the present amount of £3 3s.

Experience has proved the necessity for differentiating between the first and subsequent entries. This encourages a preponderance of breeders to test more cows than otherwise they would feel disposed to enter. Our desire is to see a larger number of cows with authenticated yields, and it is hoped that this reduction in the fees will encourage even more breeders to have the yields of their purebred stock authenticated.

—*W. M. Singleton, Director of the Dairy Division.*

Use of Sheep-dips.—In his last annual report the Department's Chemist states that his examination of powder dips has shown that instructions should be given that the dip be made up for twenty-four to forty-eight hours before using, so as to enable its active compounds to get fully into solution. The non-fulfilment of these necessary conditions may result in the dipping proving ineffective.

SEASONAL NOTES.

THE FARM.

PASTURES.

GRASS is now plentiful generally, and every endeavour should be made to keep it in a succulent condition by means of careful grazing so that the best results may be obtained and prolonged. If there is danger of the grass bolting to seed towards the end of the coming month it should, if possible, be controlled by stock. If these are not sufficient the surplus should be cut with the mower and made into ensilage or hay, or even carted off for manure rather than that a good pasture be spoilt. Later patchy roughage can be usefully disposed of by mowing with the machine set high, the material being left to wilt.

Where hay is required with a greater proportion of clovers, and in damper positions not likely to suffer from early dry spells, fields can now be closed. Provided conditions are favourable, if early mowing is practised the hay will not only be better in quality, but the fresh growth of the aftermath will be very helpful at a time when the other pastures may have become rather stale. Hay is the best foundation for winter rations, and on the great majority of farms the supply falls short of requirements. Preparations should be made for the haymaking season by selecting stack-sites on dry, convenient spots, laying down stack-bottoms of old posts, hedge-trimmings, &c., collecting fencing-materials, and overhauling mowers and rakes.

This is seasonable time for sowing temporary pastures. A mixture of 30 lb. rye-grass and 5 lb. red clover will give a large amount of feed. As a rule, spring-sown pastures have a higher clover content than those autumn-sown.

GREEN FORAGE CROPS.

The main sowing of rape will usually be made early in November. Details regarding this crop and the kales were given in last month's notes.

Maize: In average districts the middle or end of November will be quite early enough for sowing maize for forage purposes. Earlier sowing is risky, as the young plants are very apt to become checked when a few inches high. A cold, wet spell at that time seriously affects the crop and allows the weeds to get ahead of it. A common mistake is to sow too shallow; the best results are obtained by placing the seed at least 2 in. deep. Phosphatic manures should be used, together with some nitrogen, on the less fertile classes of soil; a mixture of 2 cwt. super with 1½ cwt. blood-and-bone is suitable. Maize is not among the best of feeds for milk-production when grown alone; it is better combined with either Partridge peas or Scotch tares, 1½ bushels of each per acre. Hickory King, Ninety Day, and Red Hogan are good fodder varieties.

Japanese millet: In many districts, especially in the North Island, this crop is a very useful one for grazing dairy cows during dry weather. Also, in localities where rape or kale cannot be successfully grown for lamb-fattening, millet may be tried, as it gives fairly good results. It should be sown from mid-November to mid-December, and requires a warm soil and fairly fine tilth. Farmers should beware of sowing too large an area at any one time, as the crop grows rapidly and soon becomes too rank for economical grazing. It should be sown so as to feed off in breaks. Sowing is at the rate of 16 lb. to 18 lb. through every second coulter of the drill. Superphosphate, 2 cwt. to 3 cwt. per acre, is a suitable fertilizer. Millet being somewhat exhausting to the soil, it is a good plan to sow 5 lb. or 6 lb. of red clover with it, to provide grazing in the late autumn and a cut of hay in the following year, after which the roots and stubble may be turned in to enrich the soil before the next crop is sown. An alternative plan would be to plough in the clover in September for a spring-sown crop. Rape is also sometimes sown with millet at the rate of about 1½ lb. per acre; in such case the seeding of millet should be reduced to 12 lb.

ROOT CROPS.

Swedes: In Otago and Southland especially the sowing of swedes should be put in hand during the coming month. No real substitute has so far been found for the swede in those districts, and farmers should therefore, by means of good cultivation and generous treatment, endeavour to produce high yields of this valuable winter fodder. Often large areas are sown, but for want of care only very moderate crops result. The aim should be to produce a heavy crop on a restricted area rather than a poor crop scattered over a large acreage. In most cases a more generous application of fertilizers than hitherto customary will pay handsomely. Swedes succeed best as a first crop out of grass, and are more free from disease such as club-root if the land has been previously well limed. If sown in ridges, and the ground is abnormally dry, the ridges should be rolled immediately after sowing. This assists the moisture to come to the surface, hence germination is more uniform. Be careful not to bury the seed too deeply. Seeding, if on the flat, is at the rate of 8 oz. to 10 oz. per acre, through every second or third coulter; or 1¾ lb. to 2 lb. if in ridges 28 in. apart. In many districts, apart from those mentioned, swede-sowing may conveniently be left till December. The warning given in last month's notes as to the avoidance of the grass-grub beetle ("turnip-fly") should be kept in mind in connection with root and rape crop sowings.

Carrots: From the middle to the end of November is a good time to sow the Guerande carrot for sheep-feeding. This variety is gaining in popularity for that purpose. It is best sown on ridges 21 in. to 26 in. apart; this permits intercultivation with a horse-hoe to control weeds and retain moisture. If the land is reasonably clean and no ridger available, sowing may be done on the flat through every coulter of the drill. Sow from 1 lb. to 1½ lb. seed per acre. When sown on ridges it will pay to run over them once

and pull the weeds. Thinning is not necessary with this variety. Any good phosphatic fertilizers or proprietary manures, at the rate of about 3 cwt. per acre, are suitable.

Mangolds: The main sowing of mangolds will be generally made early in November. It has been demonstrated time and again that a smaller area carefully and well worked pays very much better, and in every way gives more satisfaction, than double the area only indifferently treated. Instances can be given where, with proper cultivation and reasonable manuring, crops of from 75 tons to 110 tons per acre were produced last season at a cost of from 3s. 6d. to 3s. 11d. per ton, including interest on capital value of land, manures, &c., and allowing good wages for every operation connected with the crop. Mangolds are one of the crops that can be successfully repeated on the same ground, provided weeds are controlled and adequate manuring given. The second crop often proves better than the first, principally as a result of the extra cultivation of the previous year. Details as to the sowing, &c., of mangolds, also soft turnips, were given last month.

LUCERNE-ESTABLISHMENT.

Fields that are being prepared for lucerne should be frequently worked during the coming month, so as to destroy weeds and get the land into good condition for sowing. If the land is not clean it is better to delay sowing for a while. The third week of November is usually early enough, and in many districts the best results are secured from December sowings. Lucerne requires a firm seed-bed, consequently the land should be well consolidated with the Cambridge roller. Where no roller can be procured fair consolidation may be obtained by driving sheep backwards and forwards over the ground. The land should have been previously limed with at least 10 cwt. carbonate of lime or 5 cwt. burnt lime per acre, but double these quantities would be an advantage.

The seed should be sown at 15 lb. to 20 lb. per acre, and is best drilled in through every coulter of the drill, or half may be drilled one way and half cross-drilled, taking care to drill as lightly as possible so that the seed will just be covered, and finishing with the roller. Next to drilling, broadcasting after the roller is recommended; with this method not less than 20 lb. of seed per acre should be sown. If the land has been limed, 2 cwt. superphosphate per acre may be applied with advantage; if no liming has been done, basic super or basic slag, 3 cwt. per acre, is best used. It is good practice to mix the seed and manure and sow at once. The seed should never be mixed with superphosphate and allowed to stand for, say, a few days before sowing, as this retards germination.

In some localities lucerne will do well without inoculation, while in others it is absolutely necessary to inoculate in order to establish a stand. As a rule it pays to inoculate; even in localities where lucerne can be grown without inoculation it is found that the stands establish quicker when it is practised. There are various ways of introducing the bacteria, but for ordinary farm practice 2 cwt. to 3 cwt. of soil from a vigorous well-established lucerne-stand, broadcast and harrowed in just before drilling, can be recommended.

The second year is frequently a crucial time with lucerne. Stands that go ahead well in the first year often go off badly in the second season, showing yellow sickly patches and making poor growth. In such cases the farmer must have patience, as the majority of such stands overcome their trouble in the autumn, and, with proper management, do well afterwards. —*Fields Division.*

THE ORCHARD.

THINNING AND SUMMER PRUNING.

At this season of the year all varieties of stone-fruit will have set, and the pip-fruits will soon be reaching that stage. Wood-growth will also be fairly free if trees are in a healthy thriving condition. Both these factors will call for a certain amount of extra work during the next two months by way of thinning the fruit and also a reasonable amount of summer pruning.

Thinning: During a normal season some varieties will set more fruit than the tree can possibly mature. Where this takes place thinning should be resorted to, as no tree can mature fruit of an even grade where crowding is allowed to continue. The period when fruit should be thinned will depend largely on climatic conditions, but it is as well to remember that it is the development of the pips or stone of the fruit that exhausts the tree most. To obviate this the work should not be left too late in the season. The grower himself should be the best judge, but the best time is usually from about the middle of November to the middle of December. Later in the season thinning may be carried out by picking any malformed or diseased fruit, as this will be of very little commercial value if left on the trees until the crop is ready to gather.

Summer pruning: This is a term that cannot be accepted in its broadest sense with reference to the treatment of trees during the growing-period. Although the practice of summer pruning is not and could not be generally recommended, much useful work can be done during that period, especially upon young trees. The various branches often commence growth on unequal terms. A watch should be kept for this, and the strong-growing branches slightly pinched. This will enable the weaker ones to catch up. In this manner it is possible to build up trees with an evenly balanced framework, which is most desirable. Apart from this judicious pinching, no summer pruning is recommended, as anything that reduces the leaf-surface during the summer is harmful to the tree.

FRUIT-CASES.

The matter of ordering a supply of cases should not be left until the crop is almost ready to gather. As soon as possible after an approximate estimate of the crop can be gauged an order for case timber should be placed with some reliable firm. It is quite unreasonable to expect any firm to turn out large orders at short notice. Supplies of box timber should be coming to hand during December. It will then be possible to utilize any spare moments

in making these up, and they will have sufficient time to dry before being used for fruit. It is a foolish practice to place fruit in green cases. Quite a large proportion of the trouble met with in the way of fruit opening up in bad condition is the result of using such cases.

SPRAYING.

Last season proved to be a very bad one for codlin-moth and leaf-roller. Recurrence of these troubles can be avoided only by carrying out a thorough system of spraying, commencing soon after petals have fallen and continuing at frequent intervals of not exceeding twenty-one-day periods up to the time of picking. The brands of arsenate of lead on the market are all more or less reliable if used correctly. The paste requires 1½ lb. to 50 gallons of water, and the powder ¾ lb. The mixture should be kept well agitated while spraying is being carried out, in order to ensure an even distribution of the arsenate over the fruit and leaves. There will be no danger of burning if one uses the same weight of fresh-burnt lime reduced to milk of lime and strained into the arsenate of lead, always combining the two while they are highly concentrated.

A careful watch should be kept for the development of black-spot on apples and pears, and spraying carried out as directed in the July *Journal*.

Where powdery mildew is present atomic sulphur should be used in conjunction with lime-sulphur, at the rate of 4 lb. to 6 lb. per 100 gallons; or, if used alone, 10 lb. to 100 gallons is necessary.

Where trees have been grafted a watch should be kept when the scion is beginning to swell, and care taken to loosen the material which has been used in tying the graft. If this is not done there is often a danger of the graft breaking off at this point.

—*L. Paynter, Orchard Instructor, Christchurch.*

CITRUS-CULTURE.

Seasonal work in citrus-groves will, in the main, consist of cross-ploughing, digging, and general cultivation thereafter; also the usual spring application of bordeaux, 4–4–40, for the control of verrucosis, as soon as the blossom-petals have fallen from the main flowering. In some cases, of course, this latter operation will already have been undertaken where the trees were sufficiently advanced.

Where brown-rot has been troublesome in the grove every precaution must be taken to remove the source of infection. All infected fruits should be removed from the trees, where they have not fallen, and any fruit and leaves on the ground should be removed to a safe distance from the grove, or buried to such a depth as to avoid the possibility of further spread. The spores of this disease spread rapidly in wet weather, and may be distributed even from a considerable depth under the surface of the soil when conditions are very favourable. It is therefore most likely that any infected fruit or leaves that are turned under in the digging beneath the trees may be responsible for further spread next season. Such development may be retarded to some extent by timely application of a proper spray-compound to the surface of the soil. This will be referred to at a later date, in due season.

FIREBLIGHT.

Orchardists in the Auckland District are accorded a protection under the provisions of the Fireblight Act in regard to hawthorn, where certain areas have been scheduled under that measure. Those districts outside, although at present free from this dreaded disease, are again warned that any relaxation of due vigilance in regard to the proper treatment of hawthorn near, around, or in their orchards may mean serious loss to them. Fruitgrowers generally throughout the Dominion are asked to communicate with the nearest Orchard Instructor immediately should any suspicious symptoms on plants susceptible to fireblight come under their notice.

—J. W. Collard, Orchard Instructor, Auckland.

POULTRY-KEEPING.

END OF CHICKEN-HATCHING SEASON.

THE correct period for hatching out chickens has now passed, and poultry-keepers who have managed well will have the last of this season's birds in the brooder. No doubt many who have failed to hatch and rear the desired number of stock will continue to put down eggs for some time yet as a means of making up lost ground. Increasing the number of stock kept, however, does not necessarily mean increased profits; indeed, with the present high cost of foodstuffs the late-hatched birds may easily show a loss instead of a gain. In successful poultry-keeping strict attention to details is the great determining factor, and there is no matter of greater importance than the avoidance of having late-hatched stock on the plant.

DUCK-REARING.

Although the chicken-hatching season is now past, there is yet time to hatch out ducklings for the renewal of stock. Under proper management ducklings rapidly develop, and may therefore be hatched to advantage much later than chickens. Indian Runner ducks hatched now may be expected to lay during the next dear-egg season.

In mating Indian Runner ducks one male is usually allowed to six females. If strong robust ducklings are to be produced the parent birds should not be forced for egg-production. They should be well fed, but forcing-food such as meat should be sparingly supplied. Care must also be taken that they do not become overfat, as this is a common cause of infertile eggs and weakly stock. A mash of two parts pollard, one part bran, a half part maize-meal, and 5 per cent. meat-meal, with some finely chaffed lucerne, clover, &c., added, makes a suitable ration for breeding-birds. The amount of green material to include in the mash must be gauged by the manner in which the birds show their appreciation of it. If it is observed that they are leaving any in the food-trough it should be given in reduced quantity, or *vice versa*. Ducks should be always fed in troughs.

When food is thrown on the ground much of it will be wasted, besides which the practice has the effect of bringing the quarters into an insanitary, objectionable condition.

Incubating.—Ducklings can be hatched by artificial means in a somewhat similar manner to that employed for chickens. The temperature during the period of incubation, at the level of the tops of the eggs on the tray, should be 102° F. for the first week, from this on to the pipping-stage 103°, and 104° when hatching. If the correct degree of heat is maintained in the incubator the duckling will commence to pip on the twenty-sixth day, and hatch out on the twenty-eighth. Beware of the common mistake of trying to help the young ones out of the shell until they have been given their full time to hatch. When once the eggs have commenced to pip, the door of the incubator should not be opened until the hatch is practically cleaned up.

In general, duck-eggs do not retain their hatching-qualities as long as hen-eggs, and should therefore be placed under the incubator process as soon as possible after being laid. During the early stages of incubation duck-eggs require very little cooling. After the third day they should be turned, both morning and night. Usually the time taken to do this gives them all the cooling they require for the first week. During the second and third weeks the time of cooling should be extended by degrees up to twenty minutes or even half an hour, while during the last week they may be left out longer if the weather is favourable. The infertile eggs should be tested out after the fifth day, while frequent tests should be made to detect eggs containing dead germs. Such eggs rapidly decay and throw off a bad odour; therefore, unless removed promptly from the incubator, they are apt to injure the hatching-qualities of the remaining eggs. Usually the shell of a decaying duck-egg becomes discoloured and can be easily detected without the use of a tester. Duck-eggs require much more moisture than hen-eggs. A good way of applying this is to spray water at a temperature of 103° with the mouth on the eggs every morning after the fourteenth day. Do this after turning, and immediately place the eggs back in the machine. Do not cool after spraying. Spray in the morning and cool at night.

Rearing.—Ducklings are much easier to rear than chickens. If success is to be attained, however, several points must be strictly observed, some of which may be mentioned. The young birds should not be fed for thirty-six to forty-eight hours after hatching. In the first week the food may consist of equal parts of scalded bran and pollard, to which is added a small quantity of oatmeal and fine grit. Feed four times a day a quantity that the birds will pick up clean in about ten minutes. When the ducklings are about a week old the grit need not be mixed with the food, but it should be available to them in a shallow receptacle, so that they can help themselves. As the ducklings grow older the oatmeal can be eliminated from the ration (this being at the present time an expensive food) and maize-meal substituted. Finely cut green food, such as lettuce or young tender grass,

should be fed separately after the first week, while a little boiled minced meat should be given and increased by degrees as the ducklings develop.

Water should be given with the first meal, and from then onwards it should always be left in reach of the birds, both day and night. It is of the greatest importance that they be not given water after a long fast until they have received a meal. Even then it is a wise course to provide water with the chill taken off. Further, it is well not to let them drink to excess at the outset. Where ducklings are given a cold drink before food, and especially if they have been confined in a brooder without water, they are almost sure to suffer from staggers, with fatal results. Ducklings thus affected give every indication of being sunstruck, falling on their backs, with eyes twitching, and presenting a generally distressed appearance. They will sometimes behave in a similar manner, and with heavy mortality, when enclosed in an overhot, badly ventilated brooder. It should be always remembered that provision for an ample supply of fresh air at all times is one of the chief secrets in artificially rearing ducklings. Although ducks are water-fowl, it is imperative that their sleeping-quarters be maintained in the driest possible condition, or leg-weakness and other troubles will result. During the early brooder stage the drinking-vessels should be arranged so that the ducklings can merely get their bills into the water when drinking. This will prevent, to a great extent, bedding-material from getting wet. After, say, from three to four days the water-vessels should be placed in the brooder run, and well away from the sleeping-quarters, as a means of minimizing the wetting of the latter. At this stage the water-vessels should be of sufficient depth that the birds can wash off any food that adheres to their nostrils and at the same time give them a good blow-out. If the nostrils are allowed to clog, the eyes become plastered, while lameness, weak backs, and an unthrifty condition soon set in.

Young ducklings are very prone to sunstroke, and if not provided with good shade during hot weather mortality is likely to result. Care should be taken that the ducklings are well protected from their natural enemies, such as rats and stoats; these animals will attack them until they are fully three parts grown.

Marking.—It is important to mark ducklings as a guide to age, strain, &c., otherwise when culling-time arrives the young birds are apt to be weeded out instead of the old ones. An ordinary chicken-marker is unsuitable for this purpose, as the holes invariably grow out. The best way of placing a distinguishing mark on the duck's foot is to take a small V-shaped piece out of the edge of the web of the foot. This should be done with a very sharp penknife, the foot of the duckling being held firmly on a piece of solid, smooth board during the operation. The ducklings can be marked when leaving the incubator, and with a register the different strains and ages can be distinguished at a glance, even when they are running together.

—F. C. Brown, Chief Poultry Instructor.

THE APIARY.

SWARMING.

By November, if the weather conditions are favourable, swarming should be in full swing throughout the Dominion. Therefore it is most important that the beekeeper should note the condition of his hives in ample time to decide which colonies are to be allowed to swarm. Excessive swarming is often accepted by beginners as a proof of prosperity, but this cannot be regarded by any means as an established fact. Only strong colonies headed by young vigorous queens should be allowed to swarm, and in many cases it will be found that these colonies show little inclination to do so. Where a colony of moderate dimensions persists in making preparations for swarming it should be deprived of its queen-cells at frequent intervals, and should be requeened from better stock at the earliest opportunity. When a strong colony swarms, the swarm should be hived at once into a clean box, in such a manner that the bees may pass in and out of the box easily, and be left there till towards evening. By that time a hive should be prepared containing frames fitted with full sheets of foundation, and, if necessary, a feeder. Place the hive on its permanent stand. Late in the afternoon the hive-body should be raised from the bottom-board and a clean sack laid on the alighting-board and surrounding earth. The bees should be dumped from the box on to the sack, when they will crawl into the hive. If honey is not coming in freely, or if bad weather supervenes, the swarm must be fed with syrup prepared from sugar and water, in the proportions of one to two, so that the bees may commence comb-building at once. Excellent combs are made from sugar-syrup, and within two or three days the bees should have drawn out several combs and the queen be busily engaged filling the cells with eggs. If possible, always use foundation when hiving a swarm. The bees in a swarm are prepared for comb-building, and will simply waste much wax if placed at once on drawn-out combs.

If the beekeeper has any reason to suspect the hive from which a swarm issues to be diseased, he should leave the swarm in the box into which he has hived it for at least three days, in order that the bees may use up the honey they will have brought with them when they left the parent hive.

After the swarm has issued, the parent hive should be thoroughly examined, so that the queen-cells may be removed. Every cell except two of the best should be taken away. Where the hive contains particularly good stock, and the queen-cells are large and ripe, they may be carefully preserved and placed in nuclei for the purpose of queen-raising. Very often the best queens in the apiary are procured by this means. When the swarm has been placed in its permanent hive the frames should be carefully covered by good mats. Neglect of this precaution, even for two or three days, will often result in the bees building comb right into the roof, especially where gable-roofs are used, thereby wasting much good material as well as making the hive difficult to open.

After-swarms.—It often happens that in spite of all precautions strong colonies will throw an after-swarm within a few days of the

issue of the prime swarm. Sometimes the prime swarm will be delayed by bad weather, in which case the bees may have kept the virgin queens in their cells until the laying-queen has left the hive, only to liberate them immediately after, and before the apiarist has time to examine for queen-cells. These queens, being small and quick-moving, are very difficult to detect, and will probably escape notice altogether. In this case the after-swarm may follow very quickly after the prime swarm. Occasionally, too, a few queen-cells may be missed in cutting out. If they are built, as frequently happens, on the edge of the comb against the side of the frame they are very easily overlooked. After a little observation an after-swarm can often be detected by its behaviour. A laying-queen is heavy with eggs, and will usually seek a resting-place without delay and without venturing too high from the ground. Sometimes, indeed, she falls to the earth, and the bees will be unable to find her and will return to the hive. However, she will usually alight in some convenient spot, and the bees will cluster round her with amazing rapidity. When the hives are scattered instead of being in regular rows, a beekeeper working in his apiary at a distance from a swarming hive may miss the whole operation of the issuing of a prime swarm unless the noise attracts his attention, so quickly, as a rule, do the bees settle with a laying-queen.

With one or more virgin queens in a swarm matters are usually different. The queens are small and light, and will often soar to a considerable height, choosing their own time about settling. If there are two or three queens in a swarm there will probably be as many divisions in the cluster, so that instead of forming one compact heart-shaped mass the swarm may hang for a considerable time in several peaks. Care should be taken to see that every section is shaken into the box. A simple method of dealing with after-swarms is to place an excluder between two empty hive-bodies, the lower of which rests on the ground or a bottom-board. Shake the swarm on to the excluder, when the bees will go through the holes in the excluder, and the queens may easily be distinguished and removed. When the queens are gone the bees will return to their parent hive, and the queens may be utilized for replacing old and failing queens. There need never be any doubt as to the advisability of taking every queen from an after-swarm—there will inevitably be one queen left in the hive for the bees to return to.

ARTIFICIAL INCREASE.

This may be accomplished in several ways, but perhaps the most satisfactory is by means of nuclei and division. A nucleus is best formed of two frames of emerging brood and young bees, one frame of honey, and one containing pollen. This must be completed by a virgin queen or a ripe cell. The nuclei may be utilized throughout the season for the mating of queens for renewal, and at the end of the summer, if two or more are united, or if each one is reinforced by the addition of bees and brood from strong colonies, they may be wintered in safety, and will form good stocks for the next season. No surplus can be expected from them in the year of their installation. In dividing it is best to wait till the colony is preparing to swarm and ripe queen-cells appear in the hive. The hive can then simply be

split in two by putting half the bees and brood on another stand, taking care to leave queen-cells in each division, and for preference putting as much emerging brood in the half which is to be placed in a new position. This latter precaution is necessary in order to make up the wastage from the field-bees that will return to the old stand. Each hive can then be completed by filling the vacanies by drawn-out combs. The queen-cells in the queenless half will be nursed by the young bees, while those in the half containing the queen will be torn down by the bees when they find the hive depleted. If the apiarist wishes to be quite sure of this being done he may search for the queen and remove her while the division is being made, afterwards putting her in the hive on the new stand. The division method is advocated on account of its simplicity and the fact that there is no necessity for finding the queen before the operation. It is a most effectual preventive of swarming, and saves a great deal of trouble where increase is desired.

SUPERING.

In most districts November is early enough for the employment of supers, though much depends on weather conditions. If the weather is warm, the hives full of bees, and nectar coming in freely, the supers may now be added at any time. However, it is of no use discouraging the bees by giving additional space before the weather is warm enough to justify it. If increase is required it is as well to confine the bees to one story till the hive is overflowing with bees. This is almost certain to produce a desire to swarm, and the hive can either be allowed to swarm naturally or be divided artificially. When the first super is put on it is best, if possible, to fill it entirely or partially with drawn-out combs. If only foundation is available, one or two combs—*not containing brood*—may be removed from the bottom story to the top, and sheets of foundation put in their place. On no account disturb the brood until settled weather occurs. If foundation is used in the super, queen-excluders should not be used, as the bees will rarely travel through the excluders to work the foundation and will usually swarm. Do not bring excluders into use until the bees are quite accustomed to working in the supers.

CARE OF BEE-YARD.

Before the supers are put on it is advisable to see that the hives are raised well above the ground, so as to provide ventilation underneath and also to prevent them becoming a shelter for insects. The bottom-boards should be raised to at least the height of a brick from the ground, and they may even be a little higher, though in the latter case the alighting-board should be long and sloping to enable the heavy-laden workers to reach the hive easily if, as so often happens, they miss the entrance when descending at the end of their homeward flight. All grass and weeds should be cleared away from the hives, particularly at the entrances. To save the continual labour of this operation during the spring and summer it is a good plan to skim the weeds from the ground and to spread agricultural salt in the proportion of about 6 lb. per hive, to prevent their reappearance for the season. Although this is only a temporary remedy, it should

save mowing the grass for at least one season. Whatever the labour, the entrances must be kept free; the bees' lives are all too short and arduous, and the energy wasted in forcing their way through the tangle of weeds sometimes seen in apiaries must amount to a good deal in the course of a season.

—*E. A. Earp, Senior Apiary Instructor.*

THE GARDEN.

VEGETABLE-CULTURE.

THE gourd family of plants deserve more consideration from vegetable-growers in this country. Cucumbers, rock and water melons, marrows, squash, pumpkins, and ornamental kinds are included in this wonderful family. They require a light rich loam, heat, moisture, and proper treatment to give best results. In most districts and on many sections these conditions are available, and these varied and popular fruits can be in good supply for nine months in the year.. In the colder localities the system of removing the top soil and putting in a foot or so of fermenting material and replacing the soil before sowing may be adopted. On such bottom heat, in a sheltered garden, surprising results can be obtained even in the coldest places. Ridge cucumbers may be planted 30 in. apart and 4 ft. between the rows, and other kinds wider as required. As soon as the plants are well established nip the growing points to make them stool out, after which little training will be required except to thin out growths that tend to crowd. Cut cucumbers and marrows while young, but melons, squash, and pumpkins must be allowed to ripen. Sow the seeds now, three or four in a clump, thinning them out later when they are well established.

Continue feeding and watering asparagus, rhubarb, and salads to keep them growing strongly. New asparagus-beds should be kept weeded, and the young plants encouraged to make strong growth in a natural manner. Carefully protect the foliage, specially where strong winds are experienced.

Sow leeks and celery—if they are not already in—and brussels sprouts, broccoli, savoy cabbage, and kale. In the warmer districts where growth is more rapid the sowing of these brassicas can be delayed till the third week in November. These sowings are of great importance and should receive every care, thus ensuring a varied and excellent crop of vegetables throughout winter and early spring. The plants will be ready for putting out into permanent quarters at the end of December and early in the New Year. In preparation, the ground to be planted should now receive attention; it can hardly be cultivated too deep or made too rich. Contrary to most other crops, which are somewhat dainty feeders, these crops require most generous treatment. More than any other crop does this one depend on the preparation of the land.

For kumaras select a piece of moist sandy loam in a warm locality. It should be clean and well worked. Apply the fertilizers and harrow them in a few days previous to planting, which may be

done now as soon as danger of hard frost is past. It is customary to throw the ground up in ridges 2½ ft. apart, and set the plants 18 in. apart on the ridges. It is best to water them in if the weather should be dry.

When the weather has settled, plant out in a warm position egg-plants (aubergines, *Solanum melongena*) and capsicums (chilli-peppers). Plant them at 1 ft. to 18 in. apart, and grow them to one stem.

A few plants of tree-tomato (*Cyphomandra betacea*) might well be included where warm shelter can be given the plants. This is a perennial plant reaching a height of 6 ft. or 7 ft. or more in warmer localities in this country.

Thinning and hoeing seedling crops demands prompt attention. Hoe in bright weather and before the weeds get beyond the seedling stage of growth.

Tomatoes.

The planting of the outside crop of tomatoes will now be in general operation, and the remarks under this heading given last month will apply. Plants in doubtful condition may be sprayed with bordeaux, 3–4–50, while still in the boxes. If lime is not available 6 lb. of washing-soda may be substituted.

Under glass, the stopping of laterals and the training of plants on the strings should be attended to promptly. Occasionally one finds growers giving deep cultivation at this season, which is a great mistake. The fibrous roots are close to the surface and should not be disturbed; hoeing should be only deep enough to destroy weeds. In some houses leaf-mould (*Cladosporium*) is already making its appearance. In such cases steps should be taken to deal with it immediately. Ventilation is a big factor in this problem. Give abundant top ventilation in fine weather and commence at daybreak. Sudden high winds sometimes makes the working of a number of ventilators difficult, but if they are built of light material and securely fixed there should not be many breakages. At this stage apply bordeaux at the first sign of fungus trouble. Occasionally a plant or two is found badly affected with Fusarium wilt. As this is a root trouble, lift the affected plants with roots intact, and remove and destroy them, watering the soil from which they have been taken with a solution of iron sulphate, 1 lb. to 15 gallons of water.

Towards the end of November the first bunch of fruit on the plants will be ripening under glass. The surrounding foliage may then be removed and a straw mulch applied. When picking has commenced, in addition to necessary watering, apply also liquid manure at intervals of a fortnight or so. This is usually composed of suitable quantities of superphosphate, sulphate of potash, and nitrate of soda.

SMALL-FRUITS.

The harvesting of gooseberries and strawberries will be taking place during the coming month. With the latter crop especially it is desirable to avoid extra handling as much as possible. Sorting can be avoided if the pickers are instructed to place jam fruits in a separate receptacle to the dessert fruits. Growers should carefully study the new regulations

regarding the packing of strawberries, &c., which are summarized at foot of this page.

Young passion-vines planted out recently should be kept growing strongly. Stop lateral growth by pinching out the growing point until the vine reaches the top wires. On old passion-vines the summer crop is often sacrificed by pruning back the bearing laterals, and so augumenting the winter crop, which is more valuable. Such pruning is usually performed towards the end of November.

THE COMPOST-HEAP.

Where seedlings have to be raised in boxes annually a good compost-heap is the foundation of success. Gardeners should commence to lay that foundation now by securing a quantity of good turfy loam —from an old pasture, if possible. Stack it in the open, with the grass down, in a compact heap to decay and mellow. The old hot-beds can be placed under cover and turned occasionally; they will form a useful ingredient. It is advisable to commence preparing the materials now; there is little enough time to get them into condition before next season.

TOBACCO-GROWING.

The sooner tobacco-plants are put out now the better. Fill gaps in the planting as soon as they occur. Keep the horse-hoe busy weeding, and maintain a good, shallow tilth. When the plants become big, hand-hoeing will have to be resorted to. When the majority of the plants develop their flower-buds the plants should be stopped by carefully pinching them out. This has the effect of throwing the strength of the plant into the leaves, which quickly increase in size and thickness. Another effect is the development of laterals in the axils of the leaves. They also must be removed as soon as they are large enough to handle.

LAWNS AND PLAYING-GREENS.

Lawns and playing-greens will now be making rapid growth, and will require a great deal of attention. Cutting must be attended to regularly, and the worst weeds, at least, taken out. Give abundant rolling when the turf is moist, specially if the land be light. It will go a long way towards checking the injury sometimes caused at this season by the grass-grub, besides effecting a general improvement.

—*W. C. Hyde, Horticulturist.*

REGULATIONS AS TO PACKING OF FRUIT.

REGULATIONS gazetted on 11th September prescribe that strawberries, loganberries, raspberries, and cherries sold or offered or exposed for sale in a container shall be packed in such a manner that any fruit exposed to view shall fairly represent in size, maturity, and condition the whole contents of the container, and that the container shall be full of fruit. Nothing in the regulations is to be held to prohibit "facing"—that is to say, the methodical arrangement of the individual fruits that are exposed to view in a container—provided the previously stated requirements are complied with. "Container" is defined as meaning any package of a capacity not exceeding 3 lb. net weight of the fruit contained therein. The penalty for breach of the regulations, on conviction, is a fine not exceeding £20.

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

HAND-REARING LAMBS.

"DOUBT," Walton :—

Would you kindly advise the best way of hand-feeding lambs?

The Live-stock Division :—

Lambs whose mothers have died can be reared successfully on cow's milk. The milk should be from a cow rich in fat—as ewe's milk is high in fat—or cream may be added. During the first few days and nights a small amount of milk only should be fed—say, two or three tablespoonfuls at a time—but it must be fed often, every two or three hours. The milk should be fed from a bottle, with a medium-sized nipple attached, and should always be warmed to approximately 100° F. (blood-heat). The bottle and nipple should be carefully washed after each feeding. When the lamb is two or three weeks old it is not necessary to feed more than three times a day.

PRECAUTIONS AGAINST MAMMITIS.

F. S. METCALFE, Matakohe :—

Please inform me if Condy's crystals added to water for washing cows' teats is a preventive against contagious mammitis, and at what strength it should be used. Failing Condy's, what could you recommend as a prevention?

The Live-stock Division :—

While washing cows' teats with a solution of Condy's fluid is a step in the right direction, it will not prevent the animal from contracting mammitis. In addition to washing the teats the milking-machines should be thoroughly cleaned after each milking, and, while milking, the teat-cups should not be put on an animal suffering from the disease and afterwards placed on another animal. This would spread the disease throughout the herd. If a little milk is drawn on the palm of the hand from each teat before milking, any clots or other abnormality can be noticed, and cows showing any departure from the normal should, until recovery takes place, be milked by hand. The trouble with the majority of antiseptics used for cleansing the udder and milking-machines is that they are apt to taint the milk. For cleansing purposes a 5-per-cent solution of boracic acid can be used with advantage. As a preventive measure it is necessary that the surroundings be kept thoroughly clean.

SURFACE-SOWING OF CLOVER-SEED IN GRASSLAND.

"DIGGER," Masterton :—

Please advise me if it is an economical proposition to mix a little clover-seed with superphosphate when top-dressing hill pasture which is inclined to run out, and, if so, what variety, and how much? The pasture originally was rye-grass and clovers, but is gradually giving way to Danthonia, fiorin, and sweet vernal.

The Fields Division :—

We would certainly advise you to do as suggested, provided the clover-seed and manure are sown immediately after mixing—say, the same day. Do not sow until after danger of frosts is over, as the young clover-plant is easily heaved out; also arrange to have the pasture fairly well eaten down, so that the seed will have a fair chance of reaching soil before germination takes place. If it were possible to drive a mob of sheep behind the sowing this would greatly enhance the chances of a good take. Both cow-grass and white clover can be introduced in this manner. From 3 lb. to 4 lb. of cow-grass and 1 lb to 2 lb. of white clover per acre are suggested.

BUTTERFAT CONTENT OF WHEY.

W. G. THOMAS, Carterton :—

Kindly advise whether the butterfat content of a sample of whey from high-testing milk in cheesemaking would be greater than a similar sample of whey from low-testing milk.

The Dairy Division :—

The percentage of fat in whey from whole milk is a fairly constant amount, being around 0·27 per cent., whatever the fat content of the milk, because the fat lost is due to the unavoidable injury to the coagulated milk when it is cut with a knife in order to free the whey from the curd. With high-testing milk the loss of fat in the whey is lower per pound of fat in the milk than with low-testing milk

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LICE ON HORSES.

"NOVICE," Te Awamutu :—

Can you recommend treatment for a horse infected with lice, with the skin becoming scaly and rubbing off? The horse was covered all winter, and (at date of writing) is still being covered.

The Live-stock Division :—

All horses are subject to infection from lice, no matter what condition they may be in; but the lice, by their continual irritation of the animal, tend to reduce his condition. For treatment, first have the horse clipped all over; then, upon a suitable day, apply a dressing all over the body, care being taken to see that the mane and tail are most thoroughly attended to. At the same time the rug which has been in use upon the animal should be steeped for half an hour in a strong solution of sheep-dip, and hung upon a fence to dry. If this is not done the rug will again infect the horse, or, if used upon another before being disinfected, will carry infection to it. One dressing usually destroys all the lice, but in a few days' time the eggs which have not been destroyed hatch, with the result that if not attended to the animal will soon be as bad as ever. Herein lies the common failure to cure, as this second crop of lice, if not at once destroyed, set about propagating, and they must be destroyed before they have time to do so. The dressing should therefore be repeated in seven days, and if any lice are found in the following week a further treatment given, the rug receiving the same attention. The usual applications are any of the non-poisonous sheep-dips, sulphur ointment, or 4 oz. of stavesacre-seed to the gallon water, which has been boiled for one hour. A good dressing, after the skin has been prepared, consists of one part of kerosene and eight parts of fish-oil. In two days as much as possible of the dressing should be scraped off with a piece of hoop-iron, otherwise the animal will become very dirty if exposed to dust. When a horse infected with lice has been clipped, the clippings should be swept up and burnt. The foregoing treatment is also applicable to cows.

MAKING BORDEAUX MIXTURE.

"INQUIRER," Auckland :—

In making bordeaux mixture, if more lime than bluestone is used, does it make the mixture weaker than if equal quantities of lime and bluestone are used? For instance, if I make a mixture 4–4–40, and it tests alkaline, would the addition of 2 lb. extra of lime—making it a 4–6–40 mixture—make the latter weaker than the 4–4–40?

The Horticulture Division :—

The addition of an excessive amount of lime in the making of bordeaux mixture retards the fungicidal action of the spray and reduces its adhesive qualities. The mixture is at its best when neutral or only slightly alkaline.

GROWING LUPINS FOR SOIL-IMPROVEMENT.

"T. A. H.," Matamata :

I have a piece of somewhat sandy land, and understand that lupins ploughed in will improve this class of soil. Will you please give me information as to varieties, time to sow, &c. ?

The Fields Division :—

There are two varieties of lupins in common use. The blue lupin (*Lupinus angustifolius*) is the most suitable for clay soils, exposed situations, and cold climates. The white lupin (*Lupinus albus*) is the best for light soils, but is less hardy, and generally requires to be sown in spring. It should suit your land and district. Sow any time from mid-September to mid-December, using 2½ bushels per acre for broadcasting, or 2 bushels per acre for drilling. After broadcasting, disk once, and level off with the harrows. If sown on level-crested ploughing, a few strokes of the tines will be enough. If drilled, the seed should be buried about 1 in. deep. Unless your land has been recently manured and is in good condition, it will pay you to use 2 cwt. to 3 cwt. per acre of super or basic super, sown at the same time as the seed. This will greatly enhance the value of the crop as a soil-improver. Plough in as the crop commences to flower.

DESTROYING VARIEGATED THISTLES.

"SUBSCRIBER," Wairoa :—

Kindly advise me whether cutting variegated thistles at this time of year will be effective. The thistles have made phenomenal growth during the winter and are now nearly half-grown. There are, however, numbers of small ones. I propose cutting them now level with the ground. I should appreciate your opinion as to whether they will grow again or not this season.

The Live-stock Division (Noxious-weeds Inspection) :—

If the thistles are chipped off below the crown of the plant they will not grow again. If the cutting is done above the crown of the plant they will sprout up again and go to seed. Therefore it is necessary to chip them off with a hoe or other instrument below the crown.

SUGAR-BEET FOR FEEDING COWS.

L. R. CRAIG, Ngaere :—

Please inform me on the possibilities of sugar-beet as a feed for dairy cows; also when and how to grow this crop.

The Fields Division :—

Tests made at the Stratford Demonstration Farm for two seasons indicate that an average crop of 16 tons to 18 tons per acre of sugar-beet may be expected in your district, as compared with 25 tons nearer the coast. The seed should be sown about the same time as mangolds—from the end of October until the middle of November—in drills 14 in. to 21 in. apart, at 5 lb. to 6 lb. per acre; manure, three parts super, two parts bonedust or Nauru phosphate, two parts kainit, used at the rate of 4 cwt. to 6 cwt. per acre. When the plants are 3 in. to 6 in. high thin out to 9 in. apart in the rows. The roots should be pulled when they finish growing, about June, and stacked in the same way as mangolds, to allow them to properly ripen, when cows and pigs are very fond of them. Sugar-beets have a feeding-value of roughly two-thirds more than mangolds, the ratio being about 9 to 15. On the other hand, you should get double, and in most cases three times, the weight of mangolds per acre; besides which, mangolds are easier pulled and handled. So far as your district is concerned, mangolds should be a much better proposition for feeding cows than sugar-beet.

The Wyndham Agricultural and Pastoral Society (Southland) was formally incorporated by Order in Council dated 11th August, 1924.

WEATHER RECORDS: SEPTEMBER, 1924.

Dominion Meteorological Office.

GENERAL SUMMARY.

SEPTEMBER was, on the whole, a mild and seasonable month. There were three or four stormy periods. On the 7th, 8th, and 9th a tropical disturbance passed from the north to the east, and barometric pressure ranged over the Dominion as low as from 29·10 in. to 29·50 in. on the 8th, and brought good rains, especially in the northern districts. Westerly disturbances passed on the 15th and 16th, and a very unsettled westerly spell held sway in the South from the 22nd to the 28th. This was most beneficial in Canterbury and Otago—the breaking-up of a dry period. Rainfall was abundant on all the western coast owing to the prevalence of moist winds, but reports on all the eastern coast, except Canterbury, continue to show the deficiencies which have prevailed in former months.

Barometric pressure was above normal in the North during the greater part of the month, and very unsteady in the South.

Christchurch observatory reports the warmest September since 1917, and rainfall only 47 per cent. of the average for the month. New Plymouth observatory notes that the month was very cloudy and with less bright sunshine than any month for several years; the rainfall was heavier than usual, but the ground-temperature was high.

The high stations in the South Island had heavy rains; at Arthur's Pass 17·98 in., and at Otira 21·12 in., fell during three spells of wet weather.

D. C. Bates, Director.

RAINFALL FOR SEPTEMBER, 1924, AT REPRESENTATIVE STATIONS.

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average September Rainfall.
North Island.				
	Inches.		Inches.	Inches.
Kaitaia	4·34	9	2·22	4·75
Russell	4·10	10	1·38	3·42
Whangarei	4·37	13	1·57	4·88
Auckland	4·18	13	1·86	3·62
Hamilton	5·11	20	1·08	4·37
Kawhia	4·32	15	1·16	4·39
New Plymouth	5·41	20	1·73	5·08
Inglewood	12·31	20	2·86	9·48
Whangamomona	6·88	16	1·35	7·57
Tairua, Thames	6·98	11	2·24	4·64
Tauranga	4·25	14	1·35	4·21
Maraehako Station, Opotiki ..	6·52	14	2·30	4·28
Gisborne	1·02	7	0·48	3·11
Taupo	4·60	12	1·22	3·71
Napier	0·90	6	0·31	1·75
Maraekakaho Station, Hastings ..	1·53	9	0·45	2·58
Taihape	2·90	14	0·64	3·72
Masterton	2·53	11	0·83	3·18
Patea	3·76	16	0·97	3·63
Wanganui	2·84	13	0·70	3·05
Foxton	2·80	14	..	2·37
Wellington	2·45	11	0·63	4·05
South Island.				
Westport	3·87	18	0·73	6·82
Greymouth	5·41	16	1·21	8·26
Hokitika	10·72	19	2·06	9·14

RAINFALL FOR SEPTEMBER, 1924—*continued.*

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average September Rainfall.
South Island—continued.				
	Inches.		Inches.	Inches.
Arthur's Pass	17·98	14	4·56	14·96
Okuru, Westland	14·92	16	2·00	12·48
Collingwood	5·79	16	1·33	10·13
Nelson	3·30	14	1·82	3·75
Spring Creek, Blenheim	1·51	8	0·43	2·64
Tophouse	4·92	13	1·92	4·81
Hanmer Springs	1·43	7	0·72	4·58
Highfield, Waiau	0·77	7	0·22	3·35
Gore Bay	0·38	4	0·17	4·28
Christchurch	0·98	7	0·65	1·75
Timaru	0·98	5	0·64	2·18
Lambrook Station, Fairlie ..	0·98	4	0·48	2·30
Benmore Station, Omarama ..	2·40	8	1·16	2·14
Oamaru	1·73	13	0·55	1·74
Queenstown	3·06	9	0·83	2·52
Clyde	1·20	6	0·65	1·06
Dunedin	2·56	9	1·04	2·74
Gore	..	..	..	2·44
Invercargill	3·29	16	0·82	3·00

BOOKS RECEIVED.

"FARMERS' FOES IN NEW ZEALAND, AND HOW TO COPE WITH THEM," by F. W. Hilgendorf, Lecturer on Biology, Canterbury Agricultural College, Lincoln, N.Z.; 82 pages; illustrated; price, 3s. 6d.; Whitcombe and Tombs, Auckland, &c. Latest issued volume of the "New Zealand Practical Handbook Series"; treats of insect pests, animal parasites, &c.

"AGRICULTURE: THE SCIENCE AND PRACTICE OF BRITISH FARMING," by James A. S. Watson, Professor of Agriculture, University of Edinburgh, and James A. More, Lecturer on Agriculture, University of Edinburgh; 656 pages; illustrated; price, 15s. net; Oliver and Boyd, Edinburgh and London. A new text-book for students, covering the soil, crops, live-stock, and farm management.

GUM-TREE-SCALE SPECIMENS: A CAUTION.

IN view of the rapidity with which the gum-tree scale or blight spreads, and of the destruction it causes to eucalypts, the attention of residents in the scale-infested areas is drawn to the necessity of exercising the greatest care when sending living specimens of this blight through the post, either to Wellington or to any other district outside an infested area. In order to avoid the possibility of spreading the blight in this manner, any specimens for transmission should first be sent to a local officer of the Department of Agriculture, who will forward them preserved in methylated spirits if necessary.

New Rabbit District. — The constituting of the Turanga-o-Moana Rabbit District, Matamata County, for the purposes of Part III of the Rabbit Nuisance Act was gazetted on 9th October.

ANNUAL SHEEP RETURNS AS AT 30TH APRIL, 1924.

TABLE I.—SUMMARY BY SHEEP DISTRICTS.

Class.	Auckland.	Napier-Gisborne.	Wellington-West Coast.	Marlborough-Nelson-Westland.	Canterbury-Kaikoura.	Otago (including Southland).	Total in Dominion.
Stud rams	715	817	3,621	894	3,144	2,817	12,008
Other rams	25,599	85,896	69,403	17,210	68,174	54,524	320,806
Wethers	275,537	576,616	648,710	205,434	492,080	608,655	2,807,032
Breeding-ewes	1,051,047	3,339,805	2,758,097	671,877	2,881,047	2,374,221	13,076,094
Dry ewes	69,787	366,607	244,412	45,614	174,620	145,410	1,046,450
Lambs	545,430	1,908,176	1,508,442	331,504	1,092,030	1,127,804	6,513,386
Totals, 1924	1,968,115	6,277,917	5,232,685	1,272,533	4,711,095	4,313,431	23,775,776
Totals, 1923	1,737,857	6,022,333	5,049,473	1,266,533	4,651,658	4,353,585	23,081,439

TABLE II.—COMPARATIVE STATEMENT: TEN YEARS, 1915–24

Year.	Stud and Flock Rams.	Stud Breeding-ewes.	Stud Dry Ewes.	Stud Lambs.	Total Stud Sheep and Flock Rams.	Sheep of Distinctive Breed not entered in Flock-books, and Crossbred Sheep.				Grand Total, Stud and other Sheep.
						Wethers.	Breeding-ewes.	Dry Ewes.	Lambs.	
1915	315,251	237,717	17,341	176,556	746,865	3,270,221	12,377,624	1,365,119	7,141,592	24,901,421
1916	316,131	252,201	15,012	175,155	758,499	3,478,263	12,640,566	1,189,023	6,721,799	24,788,150
1917	329,230	160,212	6,212	114,778	610,432	3,457,824	13,099,957	1,066,435	7,035,738	25,270,386
1918	325,111	171,437	6,297	125,116	627,961	3,696,520	12,850,597	1,592,452	7,770,772	26,538,302
1919	321,304	165,676	12,196	127,150	626,326	3,922,632	12,176,224	1,799,201	7,304,171	25,828,554
1920	306,621	154,516	9,803	109,454	580,394	3,901,742	11,415,159	1,814,391	6,208,284	23,919,970
1921	322,144	158,608	9,513	110,428	600,693	3,634,799	11,989,180	1,336,306	5,724,053	23,285,031
1922	322,072	154,277	7,259	98,221	581,829	2,727,624	12,341,777	952,789	5,618,240	22,222,259
1923	330,055	172,843	9,013	119,749	631,660	2,551,627	12,890,160	808,919	6,199,073	23,081,439
1924	332,814	179,533	9,727	132,137	654,211	2,807,832	12,896,561	1,036,723	6,381,249	23,775,776

NOTE.—Stud sheep returned since 1917 are only those entered in flock-books.

TABLE III.—DISTRIBUTION OF THE VARIOUS BREEDS AND OF CROSSBREDS IN EACH SHEEP DISTRICT (1924).

Breed.	Auckland.	Napier-Gisborne.	Wellington-West Coast.	Total in North Island.	Marlborough-Nelson-Westland.	Canterbury-Kaikoura.	Otago.	Total in South Island.	Total in Dominion.
Stud sheep (entered in flock-books)—									
Merino	..	..	..	..	10,003	14,402	4,074	28,479	28,479
Lincoln	1,491	3,162	10,872	15,525	579	189	1,099	1,867	17,392
Romney	12,779	12,760	78,558	104,097	9,549	4,091	34,373	48,013	152,110
Border Leicester	189	..	536	725	324	11,159	10,764	22,247	22,972
English Leicester	584	622	412	1,618	1,290	19,195	923	21,408	23,026
Shropshire	512	..	587	1,099	149	1,846	515	2,510	3,609
Southdown	1,430	6,753	16,479	24,662	354	9,414	617	10,385	35,047
Corriedale	19	..	922	941	734	31,430	6,458	38,622	39,563
Other breeds	127	137	342	606	929	8,389	1,283	10,601	11,207
Totals	17,131	23,434	108,708	149,273	23,911	100,115	60,106	184,132	333,405
Sheep of a distinctive breed but not entered in flock-books—									
Merino	6,425	15,221	19,475	41,121	191,179	365,189	277,790	834,158	875,279
Lincoln	7,687	60,023	36,950	104,660	5,986	1,141	7,420	14,547	119,207
Romney	238,107	1,196,975	1,047,686	2,482,768	143,380	64,831	307,488	515,699	2,998,467
Border Leicester	3,798	2,552	2,668	9,018	1,545	24,214	61,797	87,556	96,574
English Leicester	3,232	1,179	1,120	5,531	7,040	32,556	5,500	45,096	50,627
Shropshire	3,602	97	1,717	5,416	1,553	4,793	1,228	7,574	12,990
Southdown	3,802	13,936	28,690	46,428	2,334	5,196	345	7,875	54,303
Corriedale	1,248	566	28,334	30,148	5,565	321,313	285,756	612,634	642,782
Half-breds	3,395	1,396	7,729	12,520	266,038	893,215	275,715	1,434,968	1,447,488
Other breeds	670	1,630	1,608	3,908	2,035	819	8,700	11,554	15,462
Totals	271,966	1,293,575	1,175,977	2,741,518	626,655	1,713,267	1,231,739	3,571,661	6,313,179
Crossbreds and others not otherwise enumerated	1,679,018	4,960,908	3,948,000	10,587,926	621,967	2,897,713	3,021,586	6,541,266	17,129,192
Grand totals	1,968,115	6,277,917	5,232,685	13,478,717	1,272,533	4,711,095	4,313,431	10,297,059	23,775,776

FORTHCOMING AGRICULTURAL SHOWS.

Marlborough A. and P. Association : Blenheim, 22nd and 23rd October.
Hawke's Bay A. and P. Society : Hastings, 22nd and 23rd October.
Auckland A. and P. Society : Auckland, 24th and 25th October.
Poverty Bay A. and P. Association : Gisborne, 28th and 29th October.
Wairarapa A. and P. Society : Carterton, 29th and 30th October.
Whangarei A. and P. Association : Whangarei, 29th and 30th October.
Manawatu A. and P. Association : Royal Show, Palmerston North, 4th, 5th, and 6th November.
Ashburton A. and P. Association : Ashburton, 6th November.
Canterbury A. and P. Association : Christchurch, 13th and 14th November.
Egmont A. and P. Association : Hawera, 19th and 20th November.
Wallace A. and P. Association : Otautau, 19th November.
Waikato A. and P. Association : Hamilton, 19th and 20th November.
Stratford A. and P. Association : Stratford, 26th and 27th November.
Hauraki A. and P. Association : Paeroa, 26th and 27th November.
Southland A. and P. Association : Invercargill, 9th and 10th December.
Woodville A. and P. Association : Woodville, 20th and 21st January.
Waimarino A., P., H., and I. Association : Raetihi, 22nd January.
Pahiatua A. and P. Association : Pahiatua, 30th January.
Clevedon A. and P. Association : Clevedon, 7th February.
Te Puke A. and P. Association : Te Puke, 12th February.
Dannevirke A. and P. Association : Dannevirke, 11th and 12th February.
Northern Wairoa A. and P. Association : Mititai, 17th and 18th February.
Masterton A. and P. Association : Solway, 17th and 18th February.
West Coast A. and P. Association : Greymouth, 18th and 19th February.
Rotorua A. and P. Association : Rotorua, 20th February.
Waiapu P. and I. Association : Ruatorea, 25th and 26th February.
Tauranga A. and P. Association : Tauranga, 26th February.
Franklin A. and P. Association : Pukekohe, 27th and 28th February.
Omaha and Pakiri A. and H. Association : Leigh, 28th February.
Taumarunui A. and P. Association : Taumarunui, 4th March.
Waikato Central A. Association : Cambridge, 4th and 5th March.
Mangonui A. and P. Association : Mangonui, 6th and 7th March.
Morrinsville A., P., and H. Society : Morrinsville, 11th March.
King-country Central A. and P. Association : Te Kuiti, 12th March.
Matamata A. and P. Association : Matamata, 19th March.
Mayfield A. and P. Association : Mayfield, 21st March.
Temuka and Geraldine A. and P. Association : Winchester, 2nd April.

Agricultural and Pastoral Association Secretaries are invited to supply dates and location of their shows for publication in this list.

Weraroa Sale of Pedigree Stock.—The annual sale at the Central Development Farm, Weraroa, which took place on 1st October, drew a good attendance, buyers being present from many parts of the Dominion. The demand for Friesian cattle was slack, a number of lots being passed; bulls sold brought up to 41 guineas, and cows 30 guineas. Red Poll cattle sold well under brisk competition, bulls realizing up to 125 guineas, and females up to 80 guineas. A good demand was experienced in the pig section. Berkshires realized up to 10½ guineas for boars, and 14½ guineas for sows; Large White boars to 10½ guineas, and sows to 20 guineas; Large Black boars to 10 guineas, and sows to 20 guineas.

State Sales of Trees and Tree-seeds.—The disposals of forest-trees and forest-tree seeds to farmers, settlers, local bodies, proprietary and co-operative companies, &c., from the State Forest Service nurseries during the last five financial years were as follows: Trees in 1920, 277,235; 1921, 520,702; 1922, 897,552; 1923, 1,475,581; 1924, 1,839,512. Seeds—1920, 130 lb.; 1921, 240 lb.; 1922, 436 lb.; 1923, 746 lb.; 1924, 618 lb.